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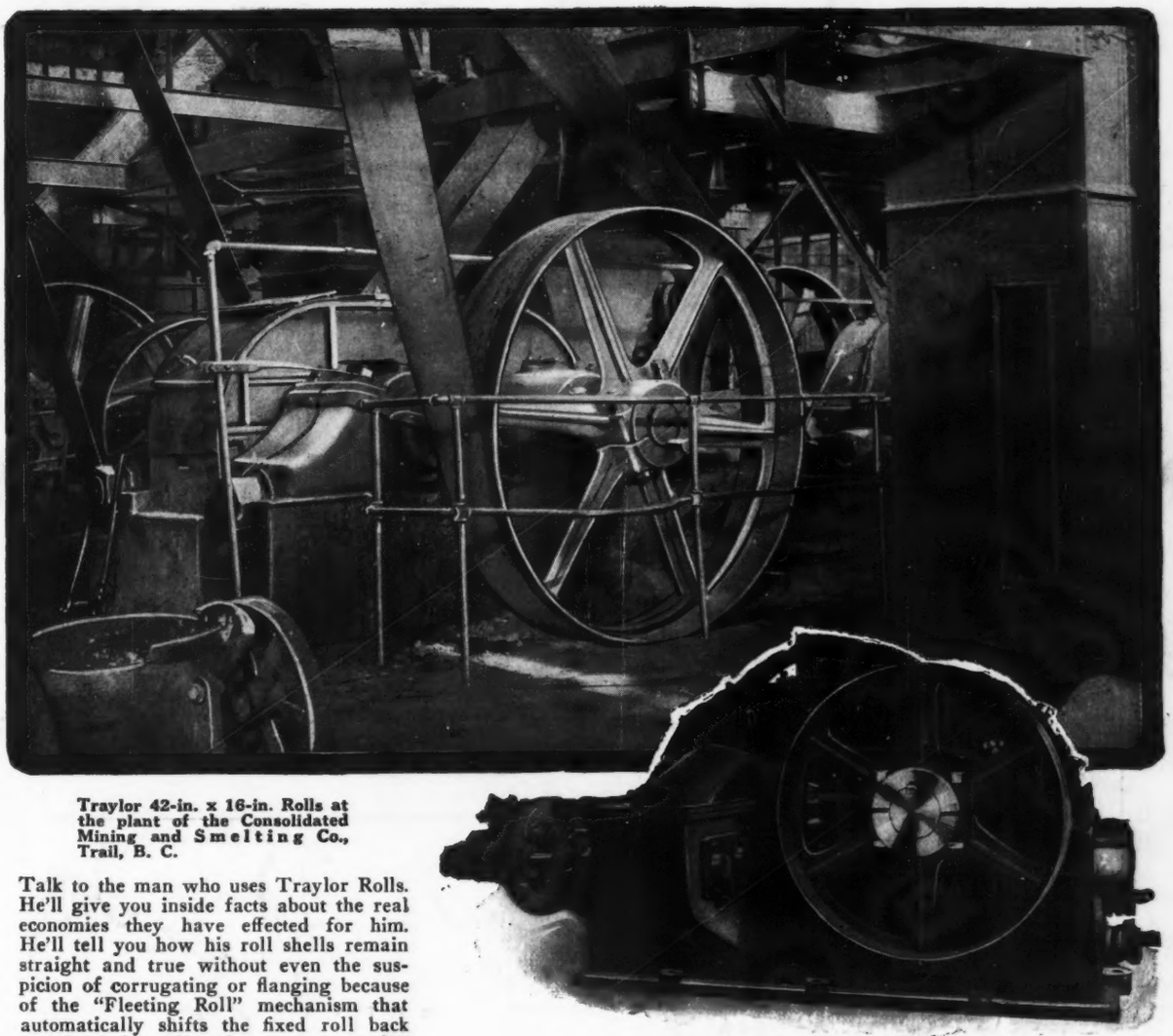
Engineering and Mining Journal

McGraw-Hill Co., Inc. Price, 20c. New York, September 27, 1919



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Volume 108 | New York, Saturday, September 27, 1919 | *Number* 13

Present Industrial Crisis Must Be Met by Dividing Profits with Labor

UNREST and discontent are world-wide. Dissatisfaction with the existing social and industrial order is practically universal.

In Russia, Bolshevism is virtually a strike against the former and now extinct government; but every other country—every nation in which men think and feel and read—is seething with the spirit of revolt and desire for change, which finds expression in strikes where there is even the semblance of organization to give form to concerted demands. And amid the epidemic of strikes and threats of strikes, unorganized labor—unnumbered artisans and workers, professional and other—must accept such poor solace and hope as may be afforded by protest from soap box, from platform, and in reams of letters to the press and to legislative bodies. The trades unionists, with, in general, a living wage, are demanding further recognition. The vast body of the unorganized, squeezed into semi-starvation by the weight of opposed industrial forces, are in a desperate and dangerous plight.

So deep-seated is the determination to alter present conditions, so vehement is the voice of protest, so all-embracing is its character, as to compel the conclusion that it has a common origin and springs from a common cause. And before a corrective can be administered, that cause must be identified, and a remedy must be sought, found, and applied. First, the facts must be determined; second, the source from which they spring must be established, and, third, a means for resolving the industrial problem must be erected.

Strikes—en masse, or by the individual as he quits his job—and the impulse that inspires and fosters them, are produced by, first, suffering, privation, and want; second, by discontent, arising from (a) insufficient pay; (b) too long hours; (c) oppressive and humiliating conditions of employment; (d) high prices (decreased purchasing power of circulating money medium).

Labor wants, and is incessantly demanding, a share of the profits of industry—and to a marked extent a part, also, in the management. It has been the habit of Labor to insist upon, and of just employers to accord, a *living wage*. Labor is no longer satisfied with a *living wage*. It is demanding a profit from the turnover. And it has learned that lesson from Capital—from Management.

Industry must readjust its practice so as to pay a profit on Labor as well as on Capital. A *living wage* is no better for Labor than for Capital. Capital—Management—demands and takes security, wage, and profit. Labor now demands a *living wage*, security, and profit. Both Labor and Capital produce *all profit*. Profit should be equitably divided.

It is begging the issue to maintain that Labor will not accept its share of business loss. It does. If a business does not prosper, it fails. Work ceases. The worker must get a new job. If it prospers, he, with Capital and Management, has achieved the result. He must and will share in the profits—plus a *living wage*. The most astute and far-seeing bankers and publicists have been proclaiming this for years. And the managers of Industry, with noteworthy exceptions, immune from the prevailing pestilence, have steadfastly refused to grow in wisdom with the world, and have been sitting tight on the safety valve. And now the machine is showing unmistakable signs of excessive heat. Who permits and encourages the impending explosion must go up with it. Apportioning the blame—fixing the guilt—will not refabricate the destruction.

It is the great privilege of the mining industry to be able to point the way to justice in this acute crisis. The managements and men—twin factors in production—have agreed, in many camps, plants, and communities, upon a plan of operation so fair, so reasonable, so just, that even a child can understand and approve it. Wages of metal miners, under extensively prevailing scales, depend on the market price of the joint production of Capital and Labor. Profiteering in the necessaries of life is curbed by approved control of retail distribution. Not in a day has all dissension been dissipated, but the way seems light, and the principle to which adherence has been pledged is on its face acceptable in good faith.

Not all industries sell their product by the pound at periodically determined fixed market prices. But all business men worthy of the designation know how to find the costs of production—and how to apportion them. And the time has come that Labor knows, also, how to find the costs—and the income; and even the rank and file are convinced that Capital is appropriating all, or nearly all, of the profits.

Evolution has made another turn of the wheel. Autocracy—political, social, ecclesiastical, and industrial—lies buried in the soil of France. Accommodation to the new order, readjustment on the new and more equitable basis, is the only alternative to a forced and violent ultimate acceptance of the conditions of the New Era. The sun of industrial feudalism is setting.

Strikes are an abomination. They are costing the world millions every day, and wasting the substance and strength of the race. The imperative need of the hour is machinery for the peaceful and orderly adjustment of industrial issues.

Americans and patriots all—proved and tried—management and men must gather at the counsel table, and with mutual patience, sympathy, forbearance, and determination to do justice, erect an industrial program that all can accept with honor and with self-respect.

Hoover

OF THE triumvirate of heroic figures that emerge from the Great War, Herbert Hoover stands forth with a distinction new to the annals of the race. Destiny accords to few men so overflowing a measure of successful and notable achievement, or such fervent appreciation of public service well performed.

New York has received perhaps two million Americans that served "over there," and the Grand Ballroom of the Waldorf has served as a setting for many important and historic episodes, but on no previous occasion has it assembled a more distinguished or representative American gathering than that which welcomed Hoover, engineer, general, master executive, and man, back to his home and to his own people.

Hoover is now at the very peak of his power—spiritual, intellectual, moral, physical. No other man embodies to such superlative degree the technical equipment, world experience, and tested and proved ability as an organizer of industrial resources. The world's best-loved man, Hoover makes at this hour an impelling appeal to all constructive elements of American citizenship. Tied to no party, owing no faction or class allegiance, he would win to his support all elements of American life that are disgusted and weary of the incessant and futile playing at the 1900 brand of politics that has discredited and disgraced Congress for the last five years. Mention, at the reception in his honor, of his conspicuous availibility as the country's next Chief Executive, brought that notable assemblage to its feet as one man, with a roar of cheers as spontaneous as it was sincere.

Hoover has richly earned a rest. He must have it. But he may not, with the consent of the people of America, retire.

That part of Hoover's address, delivered on the occasion of his reception on Sept. 16, dealing with the future of America, constitutes a veritable charter of the coming industrial dispensation. It is his platform. It is just.

The *Journal* presents for nomination for President of the United States of America at the election of 1920, Herbert Clark Hoover, Servant of Humanity.

The Steel Strike

IN HIS refusal to treat with the labor unions in regard to the adjustment of certain alleged conditions in the iron and steel industry, Judge Gary gives two reasons: First, he does not believe that the committee appointed by the unions represents the bulk of the workers, and, second, he maintains that a conference with this committee will be regarded by them as a recognition of the "closed shop."

To this interpretation of the situation, John Fitzpatrick, chairman of the committee of the American Federation of Labor for organizing the iron and steel industries, takes exception, stating that if these are the real reasons they are not sufficient "to plunge the industry into a great labor conflict." According to Mr. Fitzpatrick, employees are therefore compelled to resort to a strike; to quit work in order to prove to Judge Gary that he is wrong in his first surmise. The second reason given by Judge Gary in his refusal is pooh-poohed as having "absolutely no basis whatsoever in the present controversy."

It would be interesting to know, of course, just how many employees of the Steel Corporation are unionists, and, to go a little further, just what number of these desire representation in this instance. Approximate figures state that the number of those employed by the Corporation totals 240,000. Of these the greater proportion, it may be assumed, are eligible to become affiliated with the unions, the remainder being employed in professional or supervising capacities, and therefore undesirable as union members. Be this proportion what it may—and it seems highly improbable that the Corporation is wholly in the dark as to its employees' affiliations—the word has gone forth that it is essential that Judge Gary must be "shown" the desires of the steel workers, and the manner of demonstrating their position is to take the form of an immense tie-up.

Consideration of the second principle involved brings more or less confusion to the unprejudiced observer. Judge Gary takes the stand that in holding a conference with the representatives he would commit his company to recognition of the closed shop. The union, on the other hand, says that this statement dodges the real issue. To those who have followed earlier controversies between the labor unions and the Steel Corporation, it is a well-known fact that the objection to the closed shop dates back to the very inception of the organization. Apparently, then, the latter is only maintaining a consistent policy. Mr. Fitzpatrick's exception, in light of the above statement, seems paradoxical.

Regardless of circumstances and the arguments presented by both sides of the controversy, the issue seems to be one in which opposing wills clash against each other, both with a firm resolve to see the matter to a finish. Until a settlement is agreed upon, the public must suffer the consequences. And the public is getting tired of strikes. As stated in a recent editorial of the *New York Sun*, "the people are tired of being threatened and coerced, of bleeding through the nose eternally for the benefit of a minority. They think the time has come for a moratorium of trouble until conditions in a broad sense adjust themselves."

An issue of such magnitude as the threatened steel strike is not a matter to be dealt with lightly. It is an intensely serious issue, and one in which there can be permitted no personal aggrandizement.

Certainly the movement will meet with little sympathy from the public if such a motive is suspected. It would not take kindly to the idea that the strike was a possible result of another labor leader's desire to fill Mr. Gompers' shoes.

Mexico

THE Senate Foreign Relations Committee is attempting to ascertain the true conditions in Mexico. Inman's book, "Intervention in Mexico," has been the subject of searching inquiry. Members of the committee have questioned Mr. Inman closely in order to determine whether there was any basis for his accusation that certain interests were spreading false, or greatly exaggerated, reports for the purpose of bringing about intervention. Cross-questioning developed nothing to support Mr. Inman's insinuation.

The *New York Times* suggests that it is unfortunate that the sub-committee having charge of the inquiry is composed of an avowed interventionist, a man reflecting border sentiment, and an opponent of the administration. Perhaps this is not an ideal committee for a judicial investigation of the subject, and yet it appears from the questions that are being asked that every effort is being made to learn the truth. The fact seems to have been brought out that if any literature is being circulated in the United States that may be considered

propaganda in connection with the Mexican situation, its object is to place before the American people an accurate picture of conditions in Mexico, with the belief that the public, when once informed, may be depended upon to insist that evil conditions be corrected.

American mining interests are so extensive in Mexico, and so many American miners are looking forward to the time when they can again resume their peaceful vocation in that country, that we await with interest any constructive suggestions that may result from the present investigation.

Postal Zone Law Should Be Repealed

OUR United States postal service reaches every home and every citizen. It is such an instrument of information and education and unification that to restrict it in any way is to hurt the country. The postage rate should not be determined on the basis of cost. Cheap postage on periodicals and newspapers has made the American nation a nation of readers. This is a national benefit. To raise the postage on publications means that the publishers must add this charge to the price of their periodicals, and thus lessen reading. This is a bad thing. Compare the achievements of those nations wherein magazine reading is universal, with the backward conditions in those nations which have never encouraged widespread reading nor the extensive distribution of periodicals and newspapers.

In discussing the dangers of the postal zone law, Senator Arthur Capper, of Kansas, said: "So clearly and firmly has the American postal principle been held, that postage cost must not determine postage rate, that our postoffice has delivered letters and publications to Yankee whaling ships at Point Barrow Circle for two cents that cost over $5.60 to deliver. I would ask any thinking citizen if it is not just as important that a Yankee skipper home from a whaling cruise shall be able to understand and vote intelligently upon the great public questions of the day as it is for the citizen who has stayed at home? This principle is sound. Shall not California, Kansas, and Maine have equal postage on all information as an American right?

"It has been alleged—and maybe some have fallen victims to its un-American and illogical absurdity—that cheap postage on magazines and newspapers is a subsidy to the publishers. It is not a subsidy to the publishers. It is, if you want to use the term 'subsidy,' a subsidy to American readers. You can determine this for yourself. Who receives the benefit or subsidy when the Yankee skipper of a whaling ship off Point Barrow, in the Arctic Circle, receives news from home which costs $5.60 to deliver? Is that a subsidy to his home newspaper, his periodical or magazine, or is the benefit of that to the ship captain himself and his citizenship and our united and national standards of intelligence?"

In every case of cheap postage the primary and chief benefit is to the receiver. Why should San Francisco pay higher postage than New York merely because certain information happened to be printed in New York? Why discriminate against San Francisco?

Congress is being flooded with editorials from the country newspapers demanding that the postal-zone law be retained. At present they have their field of readers unchallenged. Congress depends largely upon public sentiment. These country newspapers are supplying their readers as well as Congress with misinformation and misstatements of fact as to the Post Office Department and postal functions. After peace legislative measures are out of the way, Congress will be ready to consider national legislation which has been impressed upon it as of paramount importance. If you believe that the postal-zone legislation is of importance to you as a citizen, and to the unified national consciousness of this country, then we urge you to write or telegraph to your Congressman to oppose the vicious postal-zone system, and use his influence to secure its repeal.

Promoting Safety

THE prevention of accidents in the mining industry is a subject which has been studied intensively only within the last ten years, but in that time wonderful progress has been made. That accident prevention is not only a humanitarian measure, but a business one as well, has been definitely proved. Practically all of the larger companies have safety engineers who devote all of their time to improving the conditions in mine, mill, or smeltery from the standpoint of the manual worker.

Next week, beginning on Oct. 4, as we state elsewhere in this issue, the Eighth Annual Safety Congress will be held in Cleveland. The Congress deserves and will have a large attendance, for it will serve as a clearing house for new ideas. It is sponsored by the National Safety Council of Chicago, well known as the central organization for the promotion of safety in American industrial plants.

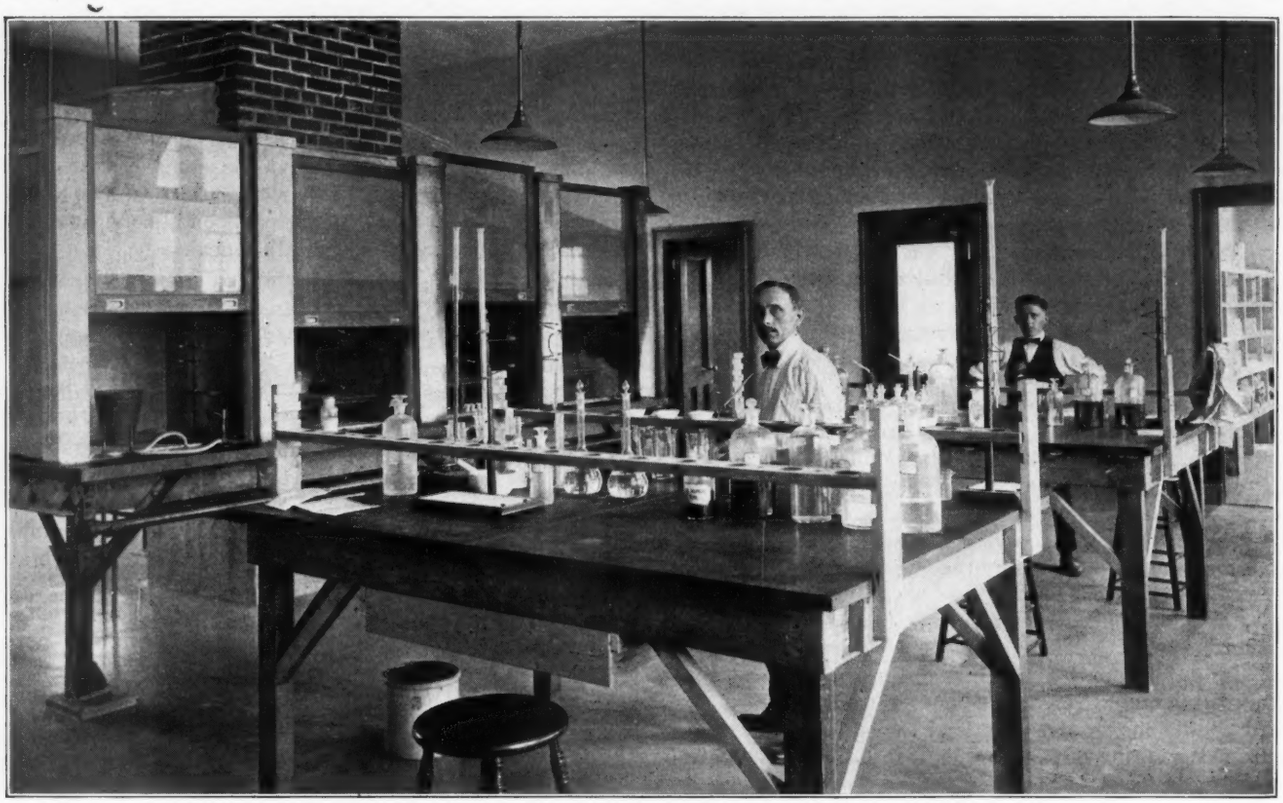
The work of the safety engineer nowadays leads him into varied fields. In addition to putting up a guard rail at the proper place, he must know something of medicine and sanitation; he must know the best form of light and where to put it; he must often be an editor of the works paper; he must be an educator and know how best to teach the workers and inculcate the safety germ into their lives; and lastly, he must be a good mixer, an agreeable fellow who will secure co-operation and whose good ideas will be enthusiastically accepted by the managers as well as by the manual workers.

The men who have studied safety problems will get much good from the Cleveland convention, but it is the class who have never given the subject much thought that will reap the greatest benefit. It is regrettable that more of these men—men who do not even know that there is to be a convention—cannot be present.

There is a general idea among the layman that the one who steps into a mine cage takes his life in his hands. This is due chiefly to three reasons—general unfamiliarity with mines (we fear what we do not understand), the occasional holocausts in coal mines, and the frequency of minor accidents incident to the nature of the work. Such meetings as the Safety Congress provides will help to prevent the last two, and the first reason is something about which we do not need to worry.

Market Report for Sept. 27 Will Appear in Issue Of Oct. 4

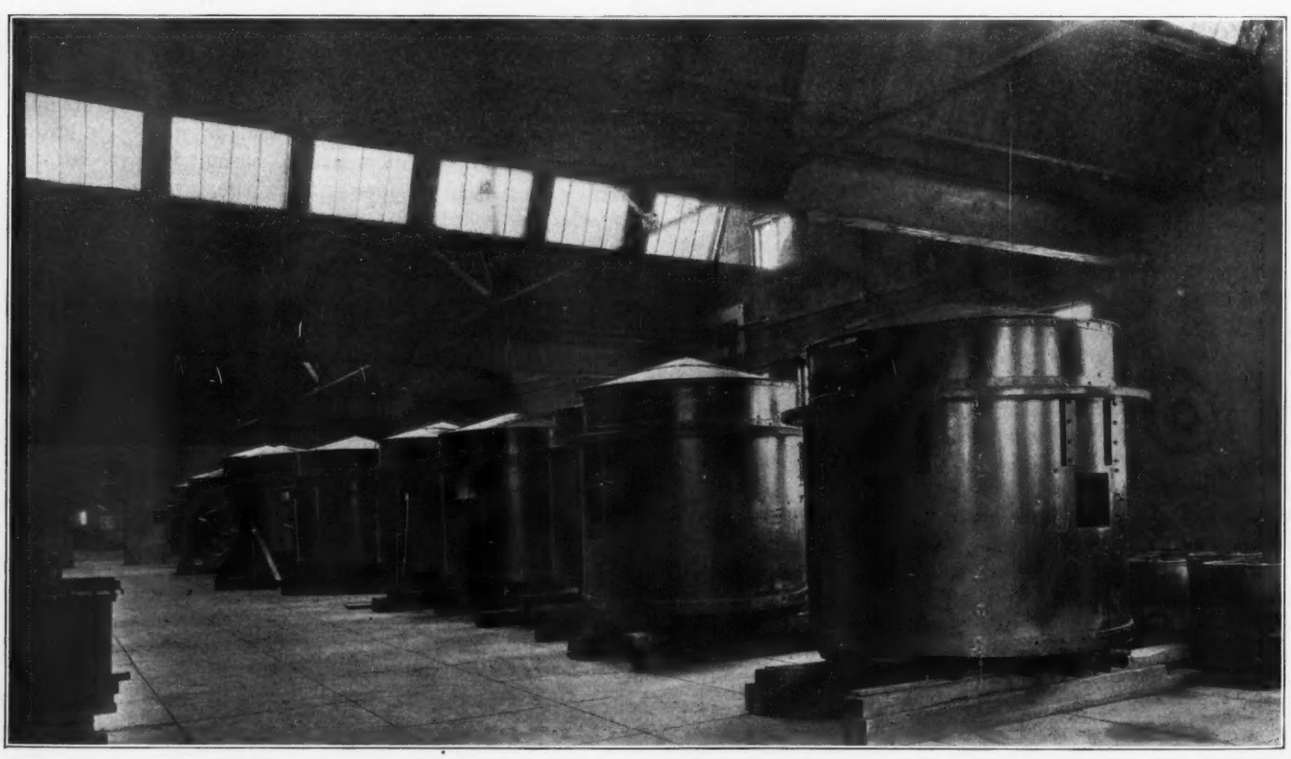
INDUSTRIAL conditions in New York have made it expedient to close the forms of the *Journal* in advance of the routine schedule date. The usual market quotations are therefore necessarily omitted from this number. The market pages which would have appeared normally in the Sept. 27 issue will be published in the *Journal* of Oct. 4. The Sept. 20 report appears in this issue.



INTERIOR OF LABORATORY OF INTERNATIONAL NICKEL CO., PORT COLBORNE, ONT.

Photographs From the Field

BAILY ELECTRIC BRASS FURNACES PREVIOUS TO SHIPMENT ON A MEXICAN CONTRACT
Furnaces are of the tilting type, and are rated at 105-kw. electrical capacity, 1,500-lb. hearth capacity, and a melting rate of 600 lb. per hour



Development of Reciprocating Air Compressors

Machines of Small Capacity Were Formerly Not Expected To Be Efficient—Change From Steam to Electric Drive Resulted in Many Makeshift Devices—Modern Machines Highly Developed

BY S. T. NELSON

IN CONSIDERING recent developments in air compressors, it is advisable to go back at least ten or twelve years, as at that time the development of the present modern compressors began to evolve from what was then considered to be the acme of perfection in compressor building. Prior to the panic of 1907, which might be referred to as one of the country's cyclic readjustment periods, industry was so busy for a number of years that there was little either of time or incentive to bring about changes in engineering and industrial development. As long as industry travels along in a regular and undisturbed channel, the need of improvement is not usually forced by economic factors, as conditions have automatically so adjusted themselves that the necessary means are forthcoming to keep business going from day to day. Eventually, however, a readjustment period arrives, and compels the realization that a reduction must be made in the cost of production, and that old, stereotyped methods must be revised and new conditions met.

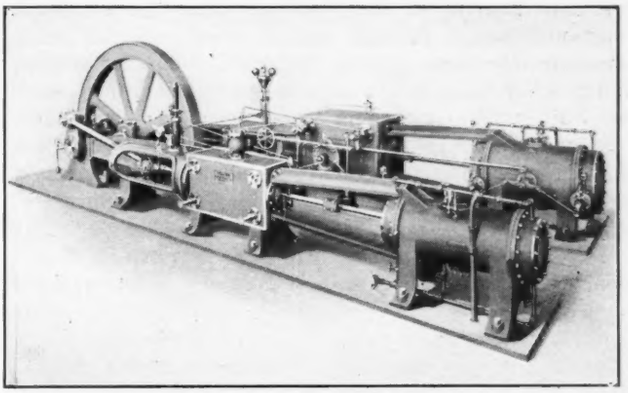
Before the year mentioned, air compressors of about 1,000-cu.ft. capacity piston displacement and up were expected by purchasers to be high-grade, efficient machines. Purchasers of compressors of less than 1,000-cu.ft. piston displacement did not usually insist very strongly on high efficiency, as there was a prevailing notion that a compressor having a capacity of less than 1,000-cu.ft. piston displacement was so small, and therefore so unimportant, that economy in its operation was not considered of vital importance.

SMALL COMPRESSORS NOT ECONOMICAL

Purchasers were usually told by compressor manufacturers (and it is practically true today) that, under varied operating conditions, the Corliss engine was the most economical prime mover in existence, and, inasmuch as a Corliss engine had to be used in order to secure good economy, it was impracticable to make a smaller compressor than 1,000 cu.ft. of an economical type, as Corliss engines smaller than this size would not show a sufficiently high steam economy to warrant the price. So manufacturers furnished to the trade compressors of the slide-valve type of the most antiquated engineering. In many instances patterns and designs were used that were over twenty years old. This was true not only of the steam end, but of the air end of the compressor as well.

Small mines and factories, often with limited means, were compelled to use these extravagant profit destroyers, there being no economical machines of that size on the market, leaving the large economical machines to the large and profitable mines and industries, and wellnigh in a literal sense exemplifying the old axiom, "Unto every one that hath shall be given; but from him that hath not shall be taken away even that which he hath."

As the readjustment period of 1907 proceeded, engineering thought had to busy itself with the problems "What shall we do to be saved?" and, "What can we do and what must we do to save others?" as those are questions that are forced upon engineers of all kinds, more especially during readjustment periods. So engineers were confronted with the necessity of producing air compressors of greater capacity for less money than the old-fashioned makeshift compressors that had been in use up to that time. The word "makeshift" does full justice to the system then prevailing. Up to that time nearly all builders of the large and economical type of compressors would first select a cross compound engine of a size nearest their requirements. Behind,



OLD TYPE OF COMPOUND STEAM-DRIVEN TWO-STAGE COMPRESSOR, WITH AIR CYLINDERS COUPLED TO REAR END OF STEAM ENGINE

and sometimes in front of the steam cylinders a pair of air cylinders would be placed of a size which could be operated by the steam engine that happened to be on hand or that could be furnished with the least cost of changes to patterns and drawings. Frequently, if the compressor manufacturer did not happen to have a sufficiently cheap Corliss engine of his own, he would fish around among other engine manufacturers until he found one. The compressor builder in that case furnished the air cylinder only, and if ever anything deserved the name "makeshift" the large Corliss compressors of that period certainly did.

If five specifications were furnished for a cross compound two-stage compressor there would be cylinders of as many different sizes as there were bidders. For compressors of 4,000- or 5,000-cu.ft. piston displacement there would be four or five inches difference in the high-pressure cylinder and twice that difference in the low-pressure cylinder, with strokes ranging all the way from thirty-six to forty-eight inches and even up to sixty inches. After the compressor manufacturer had listened to all of the weighty reasons why each bidder had figured on a machine particularly suited for his needs and why there was such a difference in cylinder dimensions between his and the others, the

would-be purchaser found himself in such hopeless confusion that he often had to submit the proposition to a consulting engineer. The latter would decide, at least in most cases, on a size and design such that none of the bidders had either drawings or patterns that would fit, so the result was a new design carrying with it so great a change in drawings and patterns that the cost of the installation was out of all reason. Then it was handed over to the purchasing agent, and the price per pound figured out. Often the contract was secured by the one who poured such a large quantity of pig iron into the sole plates that his price per pound was the lowest, every one being satisfied that he had secured the greatest bargain when he had secured the greatest tonnage. In most cases more vital points were left out of consideration.

Adaption of Steam Machines to Electric Drive

When inquiry was made for electrically driven compressors, which began to come into use ten or twelve years ago, all builders of large compressors, without exception, would take these makeshift steam-driven compressors, remove the steam cylinders, and place the air cylinders nearest to the frames. Then the electrical companies would furnish motors developed and made especially for these clumsy, heavy, slow-moving affairs, and another makeshift was added to all the others, each one built up by itself and hardly ever any two alike. In many instances the motor alone for one of these slow-running electrically driven steam machines would cost more than a modern electrically driven compressor, including motor.

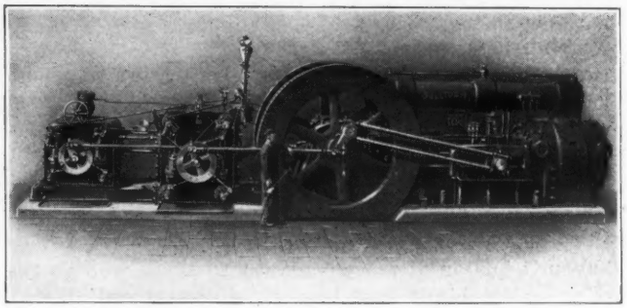
The conditions outlined had to be corrected if efficiency was to be improved, first cost and building space reduced, and also size of foundations. The only practical solution of the problem was to design compressors of standard types that could be manufactured in quantities. It also became necessary to eliminate the old-fashioned mill and factory engine from the compressor field and design an engine suitable for compressor service and for the particular machine with which it was used. Compressor builders had to cut loose from the hindrance that the factory or mill engine had imposed upon them.

Speed Increased and Weight Decreased About One-Third

One of the principal compressor manufacturers developed a self-contained, two-stage, tandem, Corliss, compound compressor in five sizes, the capacities in cubic feet of piston displacement ranging as follows: 1,000, 1,500, 2,000, 2,500, 3,000. The fact that these engines were so designed that they could not be used for any other purpose than for driving the compressor with which they were designed to work enabled the designers to use the material of which they were made very advantageously. When consideration is given to the increased speed which was possible owing to changes in design, the weights of these units, for a given quantity of air, were from one-third to one-half of the weight of the old-style, slow-running, cross compound compressor. As a result of the self-contained design, the floor space was reduced to one-third of that occupied by a cross compound compressor of the same capacity. Inasmuch as the strains and stresses were contained within the machine itself, and would not have to be transferred from side to side, as in a cross compound compressor, which, by the way, depends upon its foundation as a sort of backbone to hold it together, the foundation cost was reduced to about one-third, for all that was needed was a bed to rest upon, the working stresses being taken up in the machine itself. Thus, at one stroke, more was accomplished in the reduction of cost of material and floor space, and first cost of the compressor and compressor foundations as well, than had been accomplished in the line of compressor engineering for over twenty years previously. These machines were made up in quantities of from three to twelve of each size at a time.

Multiple Units Afforded More Flexibility

If more air was needed than one compressor could supply, two units were installed, which would provide a load flexibility that could not be obtained with the old-style, cross compound machine without seriously affecting its economy. For instance, a 5,000-cu.ft. cross compound compressor could work economically only when running at from two-thirds to full load and speed; so when, as often occurred, only one-fourth of its capacity was required, the air loss became great on account of leakage, and steam loss became excessive on account of cylinder condensation, owing to its slow speed. When two units of the tandem compound type are used, say one of 2,000 cu.ft. and one of 3,000 cu.ft.



MODERN TYPE OF TANDEM COMPOUND CORLISS TWO-STAGE STEAM-DRIVEN COMPRESSOR

capacity, making 5,000 cu.ft. total capacity, either one can be operated at its most economical volume at all times.

Another important advantage attained was in the time required for delivery. In normal times these machines can be delivered immediately, and can be installed as soon as the foundation is built, eliminating the necessity of waiting five to ten months or longer for a machine to be made up to order.

To sum up, the advantages accomplished by this redesigning of the Corliss compressor were: saving of from one-third to one-half of the material; reduction of building space and foundation cost by one-half to one-third; a considerable reduction in the first cost of the machine itself; immediate delivery in normal times, and improved operating efficiency due to the load flexibility.

The First Crude Electrically Driven Compressors

The development and improvement of electrically driven compressors from the crude machines existing previous to the period mentioned is equally interesting. Many electric power plants were being developed, or under consideration. Propositions were under way, so that when electric power became available it would take the place of steam in a great many places. In anticipa-

tion of this event, a large number of the old-fashioned, slow-moving, cross compound Corliss compressors were equipped with pulleys for rope-drive, or belt pulleys, of sufficient weight to act as flywheels as long as steam was used. When electrical energy became available a belt or rope drive was to transmit the power from the motor to the combination rope-belt pulleys and flywheels, the steam cylinders would be disconnected, and by this apparently easy process the transformation from steam to electric drive was to be accomplished.

I will relate one instance that will prove, in the light of recent developments in electrically driven compressors, the impracticability of this scheme. In this case the flywheel that was to act as a pulley for the rope drive was 22 ft. in diameter, and weighed between 60,000 and 70,000 lb. The capacity of the compressor was 5,000-cu.ft. piston displacement. The weight and size of this pulley were in themselves sufficient to condemn this scheme, to say nothing of the first cost of an 800 hp. motor with its rope drive, the addition to the building that would be necessary to house the motor and the rope drive, and the upkeep of the rope transmission. It therefore was decided that it would not pay to change from one to the other, as a modern, up-to-date compressor could be bought for less money, including motor, than the changes would cost, and the newly purchased machine would be more efficient. This case is only one of many.

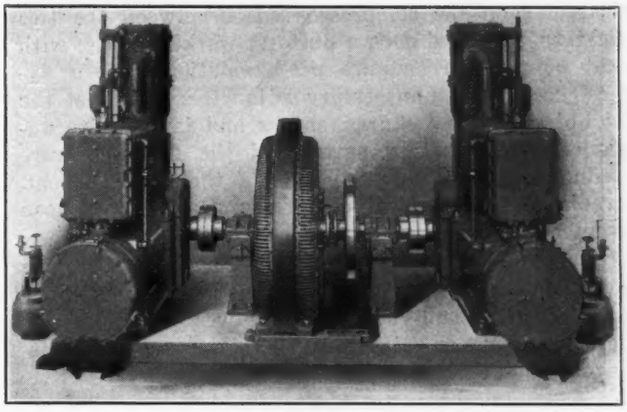
Short and Large Diameter Cylinders the Next Step

When it was discovered that a compressor so designed that it could be driven with either steam or electricity was an uneconomical, impracticable, and wasteful machine, the development of the purely electrically driven compressor began in earnest. A line of compressors of the cross compound, two-stage type having shorter cylinders and larger diameters than those hitherto used was developed by various manufacturers. This change was made for the purpose of increasing the rotative speed so as to keep the size of the motor, and consequently its price, at the lowest point possible, though a number of compressor builders still wanted to cling to certain details in design and construction that had become standard practice in connection with the slow-speed compressors.

The mechanically moved intake and discharge valves, with their heavy reciprocating valve gears and compressors designed with mechanically moved intake valves and spring-closed poppet discharge valves, were persistently favored. To meet competition, the speeds of these machines were constantly increased beyond the point at which these reciprocating valves and valve gears could be depended on for uninterrupted service, and in consequence breakages and shutdowns were numerous. A number of manufacturers had to recede from the high speeds to slower speeds, which, of course, was a step in the wrong direction, for the reason that it involved the use of an old design of valve gear that was unsuitable for electrically driven machines. These valve gears were not only troublesome at the start, but they became more so because of the difficulty of lubrication, as, even with the best oils procurable for the air cylinders, carbon deposits on the outside of the rolling valves and on the guide plugs of the poppet discharge valves necessitated frequent cleaning and delay in operation.

But when everyone was busy wondering what to do next to overcome this difficulty, the steel makers in this country, unknown to themselves, came to the rescue. Steel plate was then being manufactured from some of the new alloys for saw blades, clock springs, vibratory diaphragms, and like articles, that was much stronger and tougher than the ordinary carbon steel that had been made up to that time. Some manufacturers conceived the idea that a piece of that strong and flexible alloy steel could be used for the intake and discharge valves of compressors in much the same manner as the leather valves used in the blast furnace blowing engines of thirty-five or forty years ago.

The experiment was tried, and it was a success from the start, and the discovery marked the real starting point in the modern electrically driven compressor. The reciprocating valve gears, with their eccentric rods, eccentrics, bonnets, rolling valves, adjustable keyheads, and many other contraptions that had been carried over from the steam-driven compressor, were immediately discarded. So were valve guides, bored-out seats, springs, cushioning devices, and other parts, for the poppet discharge valves. In many cases from 1,500 to 2,000 lb. of reciprocating parts were discarded and



MODERN TWIN ANGLE COMPOUND COMPRESSOR, CONSISTING OF TWO COMPLETE COMPOUND COMPRESSORS, EACH CAPABLE OF BEING OPERATED AS A SEPARATE UNIT

from 10 to 12 lb. of steel plate valves took their place. Because of these easily moved valves, made up of steel plate from .022 to .044 in. in thickness, an additional increase in speed became possible, and lubrication trouble, which had been very annoying up to that time, was practically overcome, as the only parts of the cylinders in a modern compressor that need lubrication are the cylinders themselves and the pistons.

A lubricator having ten or twelve oil plungers was necessary for the operation of the two air cylinders and valve gears of the former type of mechanically moved valves. Under improved conditions it was possible to use two plungers instead of ten. With the increased speed due to the lighter valves came another reduction in the price of the motor.

Heavy Flywheel Still a Defect

Two objectionable features were still left—the throwing effect of the reciprocating pistons and connecting rods, especially when the compressor was running unloaded, and the heavy combination belt pulley and flywheel in the belt-driven compressor. There also remained the necessity for a heavy flywheel in addition

to the rotor, on the type of compressor that carried the motor on its shaft. These objections have now been met by some makers.

A Well-Balanced Machine Finally Developed

The angle type of compressor, built on the same lines as the Ball & Wood compound engine, and the large 10,000 hp. angle compound Corliss engines that were built for the Manhattan Street Railway Co. in New York City, solved both the annoyances due to the reciprocating masses and to the flywheel. Placing the two air cylinders at right angles to each other, and fastening the connecting rods of the two pistons to the same crank-pin, placed the reciprocating masses in such a position relative to one another that, by designing the crank so as to contain within itself the weight necessary to balance pistons, piston rods and connecting rods, a machine was secured that would run without vibration. In other words, the shocks and jars due to the reciprocating masses were eliminated by this arrangement, and a perfectly balanced machine was the result. Placing two angle compound machines side by side and connecting them to the same shaft in precisely the same manner as the 10,000 hp. Manhattan Street Railway engines, above referred to, and putting the electric motor on the compressor shaft between the two machines, produced such a uniform working cycle, with eight points of resistance per revolution, that a flywheel became an unnecessary adjunct. So at last the two objectionable features, shocks and jars due to unbalanced reciprocating parts, and the flywheel, were eliminated. The result was one of the most efficient, durable and economical compressors that have been invented up to this time.

Now the users of compressed air may have the same economical operating cost below 1,000-cu.ft. capacity that formerly could be enjoyed only by those whose operations were sufficiently large to warrant compressors of 4,000-, 5,000-, or 6,000-cu.ft. capacity.

Butte & Superior Mining Co.

The twenty-second quarterly report of the Butte & Superior Mining Co., covering the second quarter of 1919, was issued on Aug. 8, 1919. The following statement shows the principal operating features for the quarter, as compared with those for the first quarter of 1919:

OPERATING DETAILS BUTTE & SUPERIOR MINING CO., FIRST AND SECOND QUARTERS, 1919

	Second Quarter	First Quarter
Dry tons of ore milled	99,562	71,298
Average zinc content (per cent.)	14.459	15.436
Average silver content (oz. per ton)	6.475	6.710
Zinc concentrates produced	25,905	19,307
Average zinc in concrentrates (per cent.)	54.064	54.50
Total zinc in concentrates (lb.)	28,010,363	21,044,540
Average silver in zinc concentrates (oz. per ton)	22.113	22.012
Mill recovery (per cent zinc recovered in concentrates)	97.287	95.606
Direct mining cost (per ton)	$5.9774	$6.4003
Direct milling cost (per ton)	$2.7851	$2.9967
Total direct cost mining and milling (per ton)	$8.7625	$9.3970
Indirect, or general costs (per ton), exclusive of freight	$0.7080	$1.3760
Total costs (per ton)	$9.4705	$10.7730

Exploration work during the quarter was confined principally to diamond drilling, there having been 626 ft. of drilling completed. Development work done consisted of 3,341 ft. of drifting, 1,674 ft. of crosscutting, 548 ft. of raises and winzes, and 144 ft. of shaft raises. The tonnage of ore developed during the period was somewhat greater than the tonnage extracted, so that the ore reserves show a slight increase as compared with the previous period.

The amount of ore mined was considerably greater than during the first quarter, but was markedly below normal production, as a consequence both of the low zinc prices prevailing and of the shortage of labor. The cost of mining was $5.98 per ton of ore, as compared with $6.40 per ton for the previous period.

The end of the quarter showed a marked increase in the tonnage of ore milled, and there was a continued slight decrease in milling costs. There was milled during the quarter 99,562 tons of ore, at an average cost of $2.785 per ton, as compared with an average cost per ton of $2.996 for the first quarter. Mill operations showed a recovery of 97.29 per cent of zinc in concentrates, averaging 54.06 per cent zinc and 22.11 oz. of silver.

In the month of June, as a result of the decision of the United States Supreme Court in the flotation case, the amount of oil was increased to more than 1 per cent, with a resultant slight increase in the cost of milling, due to the additional oil contained therein, but with particularly satisfactory metallurgical results, which clearly demonstrate that no serious obstacle will be encountered in the altered practice.

Financial results of operations for the second quarter, as compared with the previous period, are as follows:

FINANCIAL STATEMENT BUTTE & SUPERIOR MINING CO., FIRST AND SECOND QUARTERS, 1919

	Second Quarter	First Quarter
Net value zinc concentrates at mill	$608,741.45	$382,156.11
Net value lead concentrates at mill, and residues	368,664.01	250,336.85
Metal inventory and quotations	150,000.00	
Miscellaneous	25,727.13	19,193.61
Total	$1,153,132.59	$651,686.57
Operating costs, taxes, etc	942,906.51	768,065.42
Profit	$210,226.08	
Loss		$116,378.85

The above statement includes charges for depreciation, taxes, etc., but no allowances have been made for depletion. The average price of zinc used for estimating the profits for the quarter was 6.38c.

On June 2, 1919, the Supreme Court of the United States rendered its decision in the case of Minerals Separation, Ltd., et al. vs. Butte & Superior Mining Co. The decision of the Supreme Court reversed and modified the decisions of the Circuit Court of Appeals for the Ninth Circuit and the United States District Court for the District of Montana. The substance of the decision of the Supreme Court of the United States is that when the Butte & Superior Mining Co. was using a fraction of 1 per cent of oil on the weight of the ore it was infringing the patent of Minerals Separation, Ltd., and that when it was using 1 per cent or more of oil on the weight of the ore it was not infringing the patent of Minerals Separation, Ltd.

As Butte & Superior has clearly demonstrated that satisfactory results will be obtained by the use of 1 per cent or more of oil on the weight of the ore, the injunction enjoining it for using less than 1 per cent will not disturb or materially affect the operations conducted at the Butte & Superior plant.

Manganese Ore Exports From India for the fiscal year ended March 31, 1919, were 385,361 gross tons, as compared with 433,331 tons in the previous year, according to *Iron Age*. Of the former exports Great Britain took 295,230 tons, and France, 57,400 tons, with smaller amounts to Belgium, Italy, Japan, and the United States.

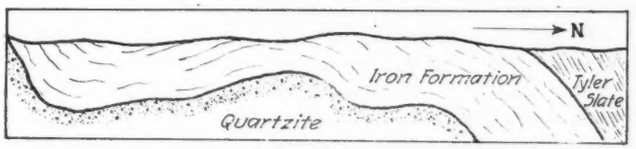
Geology of the Gogebic Range and Its Relation To Recent Mining Development—Part III*

Influence of Faults on the Forming of Orebodies Such That Careful Study Is Necessary in Planning Development Work—Four Types of Faults Evident, Each Bearing a Definite Relation to the Iron Formation

BY W. O. HOTCHKISS
State Geologist and Consulting Engineer, Madison, Wis.

THE strike of the Ironwood formation is shown in Fig. 1[1]. The dip in the mines varies little from 60 degrees to the north, excepting where folds or faults have caused local changes. Toward the extreme east and west ends of the range, variations are more common, and the dip varies from a steep northward overturn (in minor instances only) through horizontal to an occasional steep southward inclination.

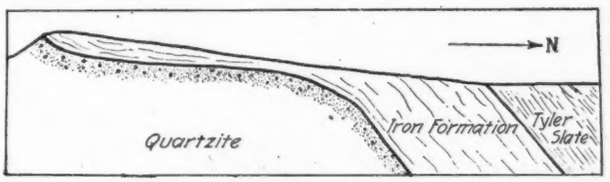
Folding.—Folds of a minor character are occasionally found in the productive mines, but they are only small drag folds a few feet across. The west end of the range, from a few miles east of Mellen to Lake Namakagon, has been folded on a much larger scale. Fig. 18 shows a section of the fold in Section 9, T.45N., R.2W.,



Sec. 9-45-2W.

FIG. 18. CROSS-SECTION OF THE FOLD IN THE IRONWOOD FORMATION IN SEC. 9, T. 45N., R.2W., SHOWING THE QUARTZITE, THE IRON FORMATION AND THE TYLER SLATE

about three miles east of Mellen. The fold in Section 18, T.44, R.3W, Wisconsin, is shown in Fig. 19. Just East of Mineral Lake, in Sections 13 and 24, T.44, R.4W., notable crumpling and faulting of the formation on a large scale occur, and this is shown by the small outcrop map, Fig. 20. Farther west the formation has been much folded, but its general northward dip is preserved. At the extreme east end of the range, similar folding has taken place.



Sec. 18-44-3W.

FIG. 19. CROSS-SECTION OF FOLD IN SEC. 18, T. 44N, R.3W., SIMILAR TO FIG. 18

In general it may be said that the minor folding is not known to have played any part in localizing ore deposits. The one important item in the attitude of the beds, from the point of view of the effect on origin of ore, is the 60 degree northward dip.

Faulting.—Throughout the whole extent of the iron formation and the rocks associated with it, faulting is very common. Many of the faults have been identified in recent mining developments, in drilling, and in geological work, but many more undoubtedly remain to be worked out by more careful and extended observation. Many can be discovered by careful dip-needle work on the magnetic lines marking the Pabst and Pence members. More careful observations on faults will undoubtedly be made, as they are an important element in the formation of orebodies, and therefore a knowledge of the details of faulting is necessary for the proper planning of exploration and development operations.

That faulting occurred at widely different periods is definitely known, as faults of one kind cut across and displace earlier faults. As faulting has not been

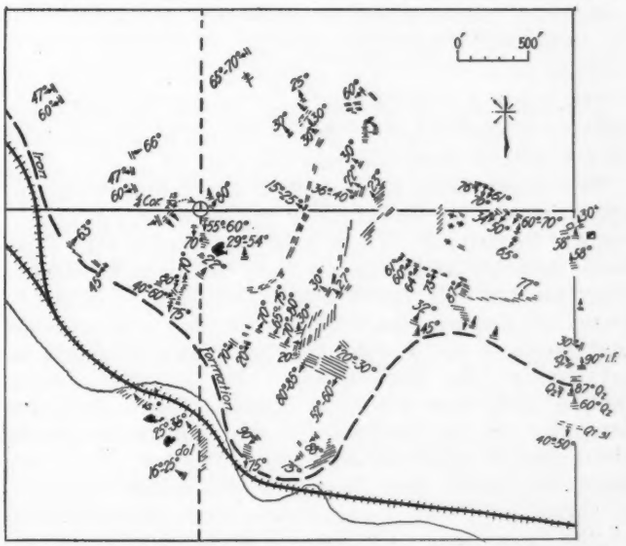


FIG. 20. OUTCROP MAP OF FOLDED AND FAULTED AREA IN SECTIONS 13 AND 24, T. 44N., R.4W.

studied thoroughly in many of the mines, it is impossible to make final statements with regard to the relative ages of all the faults. Few determinations have been made that definitely fix the relative ages. Whether all other faults of the same general types will be found in agreement with the facts thus far observed, only more detailed work will show.

Faults are "planes of weakness" in a formation, and at any time after the first break has occurred further movements may take place. It is not at all unlikely that slight movement is going on along some of the faults in this range. If such movement has occurred, it is obvious that older faults may now appear to displace younger ones. Complications of this sort may possibly be discovered by future observation.

On the basis of the present only partly conclusive data, there are four types of faults of relative age,

*Parts I and II were published in issues of the *Journal* of Sept. 13 and Sept. 20, 1919, respectively.

[1]"Geology of the Gogebic Range and Its Relation to Recent Mining Development—Part I," *Eng. and Min. Journ.*, Sept. 13, 1919.

the most recent being given first and the earliest given last, as follows:

1. Faults striking nearly perpendicular to the formation and nearly vertical in dip. These are called transverse faults.

2. Faults striking nearly parallel to the strike of the formation or parallel to eastward-pitching dikes, and nearly perpendicular to the beds. These are called Eureka type faults, from one of the best-known faults of this kind.

3. The great Sunday Lake fault, the only one of its type.

4. Faults parallel to the beds of the iron formation. These are called bedding faults.

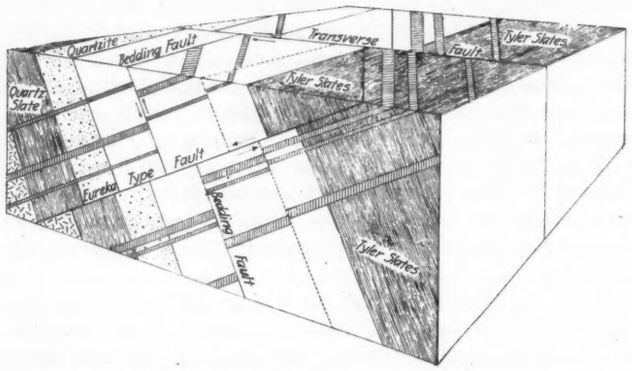


FIG. 21. BLOCK DIAGRAM SHOWING RELATION OF TRANSVERSE FAULTS, EUREKA TYPE FAULTS, AND BEDDING FAULTS

The first two and the last types of faulting and their relation to each other, so far as known at present, are shown in the block diagram in Fig. 21.

The latest faults to be formed are those which cut approximately perpendicular to the beds and are nearly vertical in attitude. These transverse faults may vary rarely as much as 45 degrees from the direction stated. They are the only faults definitely known to have affected the Keweenawan volcanic rocks, but it is probable that faults of the Eureka type may later be found to cut through the Keweenawan. The greatest known fault of this type is that at Penokee Gap. Here the formation on the west side of the fault is set north about 900 ft. relatively to that on the east side. No facts are known that determine the actual direction of throw here, but it is probable that the movement on the fault plane took place in a direction nearly at right angles to the plane of the beds.

Another pronounced fault of this type is that at Potato River Gap. Van Hise described this[2] as having a horizontal displacement of 280 ft., the west side of the fault moving to the northward.

The two faults mentioned are the only large ones of this type known in the Ironwood formation. Displacements of moderate throw are found at short intervals all along the range. Where the iron formation occupies the crest of the ridge west of Penokee Gap, small notches in the ridge are found every few hundred paces, where the offset of the formation is as much as twenty feet. The notches mark the places where broken fault material has been eroded. In the mines small transverse faults with an offset of only a few feet are common, and some with a horizontal offset of nearly 100 ft. are known.

The direction of relative movement in these transverse faults varies. West of Penokee Gap a number of adjacent small faults show the formation on the west side of the fault offset to the north. Elsewhere, there seems to be little regularity, but too little is known to warrant the conclusion that no regularity exists. The movement between the fault blocks has been slight, and the blocks have probably tilted more or less during the faulting, so that in a single fault it may be found that though one side is offset to the north at surface, in depth the other side may be set north.

Faults of the transverse type have been observed by Gordon[3] in the Keweenawan lavas making the ridge north of the Tyler slate formation. Horizontal offsets of as much as 1,500 ft., and many of lesser magnitude, were noted by him. He states, further, that the offset seems to decrease greatly as the faults are followed south. These faults cut the trap range into blocks with high vertical fault-plane cliffs which are very striking when viewed from the mines. In the iron formation the largest of these faults produces an offset which is only a small fraction of the offset in the lavas.

This same effect—of smaller offsets as the fault is followed to the south—is observed in the iron formation itself. Transverse faults, which have offset the beds nearly a hundred feet at the north side of the formation, have produced only twenty or thirty feet of offset at the south side. It has long been accepted that all faults die out with depth. Here is an instance where apparent lateral dying out is due to the fact that the faults were probably formed when the iron formation was nearly horizontal in position. The subsequent tilting has resulted in eroding away the formation, so that there now appears in cross-section at the surface what formerly, at the time when faulting occurred, represented miles of depth from what was at that time the surface of the earth. The transverse faults are known to offset all intrusives in the iron formation and

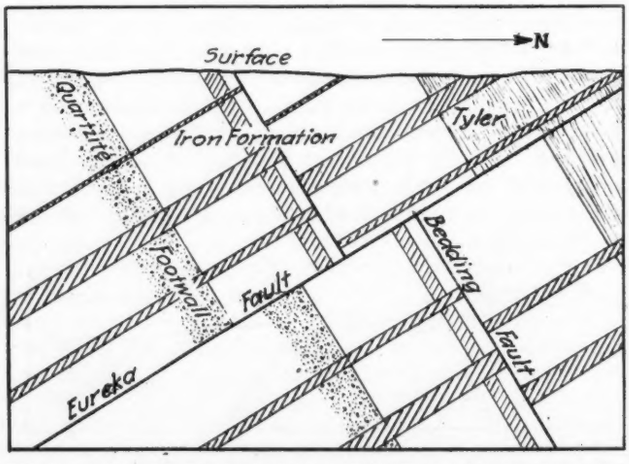


FIG. 22. DIAGRAM SHOWING MOVEMENT OF THE EUREKA FAULT IN THE EUREKA MINE IN CROSS-SECTION

all other types of fault excepting the Sunday Lake thrust. Other evidence, however, is conclusive that the transverse faults occurred long after the Sunday Lake fault.

Extending from the Tilden mine through the Eureka mine, and for unknown distances farther east and west, there is a fault which dips toward the foot wall and strikes nearly parallel to it. In the Eureka mine this fault offsets the iron formation, as shown in Fig. 22. In the Tilden mine this offset is reversed, and the offset

[2]Monograph XIX, U. S. Geological Survey.

[3]1906 Annual Report Michigan Geological Survey, p. 464.

is as shown in Fig. 23. These figures are not actual cross-sections of the mines named, but only diagrams to show the offset due to the fault. This fault acted after the manner of a pair of monster millstones. Looking down upon it from the south, the upper block turned as though it were driven by a shaft turning in the

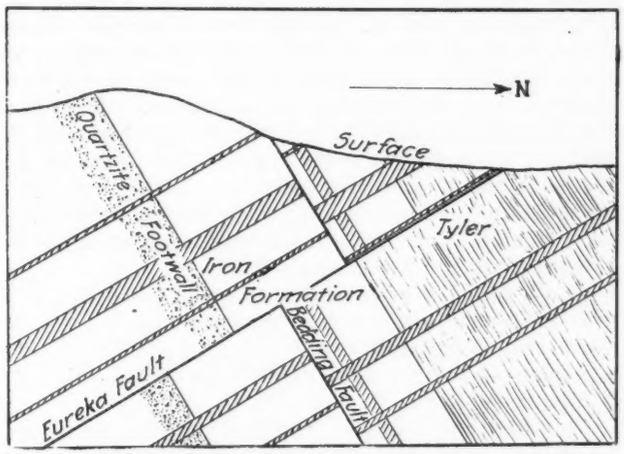


FIG. 23. DIAGRAM SHOWING MOVEMENT OF THE EUREKA FAULT IN THE TILDEN MINE IN CROSS-SECTION

direction of the hands of the clock, the part west of the pivot moved north and that east moved south. The point where there is no offset, the pivot of these millstones, is situated in the Palms mine. The greatest offset known in the Tilden is about 225 ft.; that in the Eureka is about 300 ft.

Other faults of the Eureka type are known in the Asteroid and Mikado mines, to the east, and in the Plymouth and Wakefield mines. Most probably, the faults which set down to the south the great block of formation in which the latter two mines lie are of the Eureka type. Much must be learned about these faults before this can be stated as a certainty. It is entirely possible that they represent a fifth type of fault. Faulting of the Eureka type has been definitely recognized west of the Tilden mine only in a few cases of slight displacement, but it is not at all unlikely that larger faults of this type will be found.

The Eureka fault is offset by the transverse faults, and so must have existed when the transverse faulting occurred. It in turn offsets the bedding fault and the sill, so that these must be older.

THE SUNDAY LAKE FAULT

The Sunday Lake fault is probably the greatest fault on the Gogebic iron range. It has been studied for a number of years by Dr. C. K. Leith and some of his students. A number of the latter have written theses on the structures in this Wakefield area, and one of them, M. C. Lake, geologist for the M. A. Hanna Co., wrote an article which appeared in Crowell and Murray's "Iron Ores of Lake Superior," 1917. A map of this faulted region is shown in Fig. 24, and is adapted from Mr. Lake's map. The base of the iron formation on the east side of the fault is nearly a mile and a half northwest along the fault from the base of the iron formation on the west side of the fault, but whether this is the actual direction of throw of the fault or not is somewhat doubtful. The throw is probably at right angles to the dip of the formation. From all the information at present available, the fault is approximately vertical in its dip, and the strike, as shown in Fig. 24, is approximately northwest. The main movement along this fault plane occurred when the beds of the iron formation series were horizontal, before any appreciable tilting had taken place. The beds on the east side of the fault were then over-thrust upward in a westwardly direction. Associated with this thrust fault there was folding and crumpling of the beds, as shown in the hill of Palms quartz slate at Wakefield. After this fault occurred, there followed a period which resulted in the complete erosion in some places of the Tyler slates on the eastern side of the fault, so that when the Keweenawan lava flows began to pour out, they, or Keweenawan conglomerates, rested in many places directly upon the iron formation.

So far as is indicated by information at present available, this fault does not cut the Keweenawan traps, and though there may have been a later movement along this fault that has displaced the traps, there is no question that the major movement occurred before Keweenawan time. There is no evidence that the bedding fault

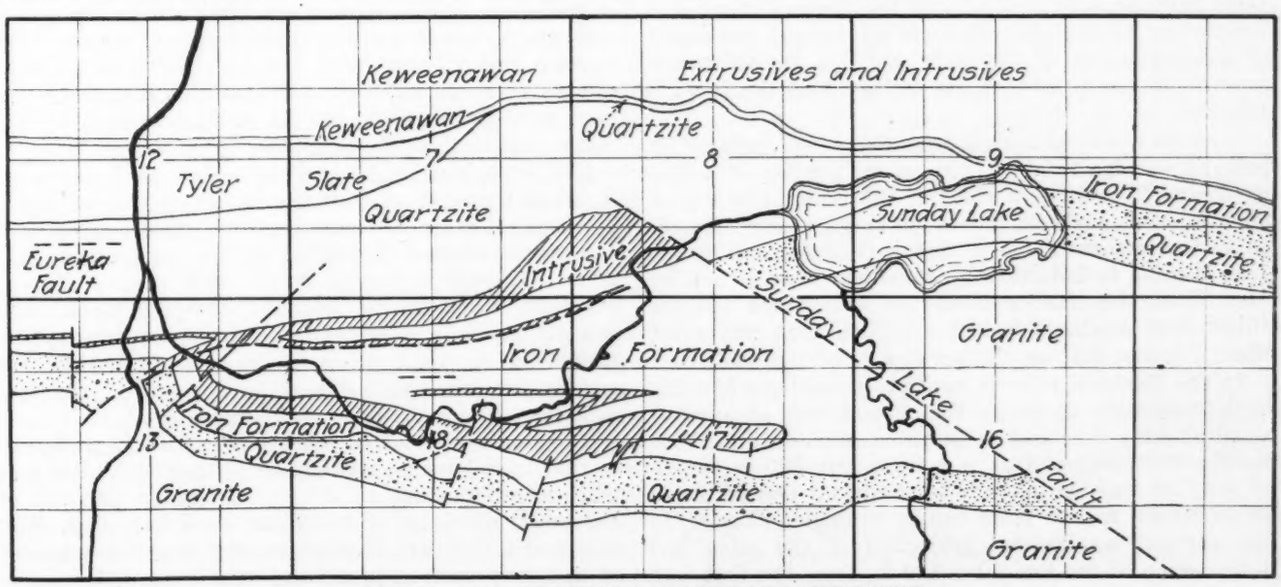


FIG. 24. MAP OF REGION OF SUNDAY LAKE FAULT
After M. C. Lake in "Iron Ores of Lake Superior," Crowell and Murray.

cuts through the Sunday Lake fault, and, on the other hand, bedding faults are known in the iron formation east of the Sunday Lake fault. Though it is impossible to say that these bedding faults correspond to the great bedding fault movement west of the Sunday Lake fault, it is not at all improbable that they do. If so, the Sunday Lake fault must have displaced the bedding fault. Furthermore, the bedding fault, in its strong eastward movement of the beds north of the fault, would have produced a notable offset in the Sunday Lake fault if it were the younger of the two.

Bedding Faults

Faulting in the Ironwood formation along planes parallel to the bedding is found near the base of the Plymouth member, in the Yale member, and in the Pence member, and also in the Pabst member of the Tyler formation. So far as my observations have gone, the amount of movement on any of these fault planes is comparatively little, except in the Yale. The great bedding fault is found, for the most part, in or near the black ferruginous slate of the Yale member. This fault does not follow a single bed, but in some places is found at the very top of the Yale member, or even in the lower part of the Norrie, and at other places is found at the very base of the Yale.

The movement occurred sometimes along a single shear plane, but more often along two or three planes—usually all in the Yale member. The main direction of movement along this fault can be best described by stating that the beds above or north of the fault plane have moved to the east. As is the case in many faults, the amount of movement has been greater in some parts of the plane than in others, and the amount of eastward shove of the beds north of the fault apparently increases as investigations proceed west. In addition to this eastward movement of the upper beds, there has been in most places a movement up or down the dip of the beds. In the Tilden mine the beds north of the fault have gone downward. In the Geneva mine, and everywhere to the west, there is an upward movement of the beds north of the fault, and this upward movement increases in amount the farther west the fault is followed.

As mine workings seldom touch the exact spots which make it possible to identify the same portion of a dike on the north and south sides of the fault, it is impossible in most parts of the range to give exact figures as to the movement. The eastward component in the Norrie mine is indicated by the fact stated to me by Mr. Olson, the chief engineer on this range for the Oliver Iron Mining Co., that a vertical dike was offset 650 ft. to the east on the north side of the fault.

In the Montreal mine it has been possible to identify with reasonable certainty the intersection of a westward-pitching dike and an eastward-pitching dike, both on the foot wall and at a point about 300 ft. north of the foot wall, so that the total amount and direction of movement at this point can be estimated closely. In the vertical longitudinal projection of the mine, the intersection of the two dikes 300 ft. from the foot wall is 840 ft. east and 375 ft. upward in vertical projection from the same intersection on the foot wall. Translating this into terms of movement on the actual fault plane would mean that the beds to the north of the fault moved a total distance of approximately 950 ft. eastward and upward, or approximately 800 ft. along the strike of the beds and 200 ft. up the dip of the beds.

The easiest method of measuring this fault is in the mine cross-sections, where the actual offset of the dike in each section can be scaled in places where the same dike can be identified both north and south of the fault. The offset measured in a section like this will, of course, vary with the pitch of the dikes, and does not give any actual measure of faulting, but it does give the approximate distance that would have to be raised in the mine workings from a dike in the foot side of the fault in order to get the same dike north of the fault. Measuring in this fashion, the measurements given in the following table indicate the distance which the two parts of a dike on opposite sides of the fault are displaced in the vertical cross-section. The first measurement is in the easternmost mine where information is available, and the succeeding measurements are progressively farther westward:

Tilden Mine—North side down about 100 ft.
Davis-Geneva—North side up 60 to 100 ft.
Aurora—North side up 150 ft.
Ashland—North side up 200 to 250 ft.
Montreal—North side up 425 to 500 ft.

The bedding fault is displaced by the transverse faults and by faults of the Eureka type. These facts indicate that the bedding fault was present when the other two types of faulting occurred. In its turn, the main bedding fault displaces the intrusives in the iron formation so far as relationships are known at present. Therefore, the bedding fault must have occurred after the intrusives had entered the iron formation. Apparently, also, this bedding fault is offset by the Sunday Lake fault, so that the latter apparently occurred after the bedding fault took place.

Intrusives

Both in the productive as well as in the non-productive parts of the range the intrusives consist of numerous dikes and a sill which is known to extend from the Mikado mine on the east to the Yale mine on the west. The intrusives are much more complicated and much less known in the extreme eastern and western ends of the range, but no attempt is made to discuss these at this time. All of this discussion applies only to the dikes in the productive part of the range and to the sill.

The intrusives in the iron formation are much alike in character, such variations as are noted being chiefly size of grain or difference in color. They are diabase or diorite of medium to fine crystalline character. The sill is parallel to the beds, and, so far as observed, seems to be intruded into the black slate bed of the Yale member. The dikes are nearly perpendicular to the bedding of the iron formation, but usually are somewhat steeper in dip toward the foot wall than this statement would indicate.

The larger number of dikes have an eastward pitch, so that in following eastward along the foot wall a dike will drop from 20 to 35 ft. in going 100 ft. of horizontal distance. Some dikes have less pitch than this and a few are steeper, a very few being known to be nearly vertical in dip and striking directly across the iron formation. In addition to these eastward-pitching dikes there are those which have a westward pitch. In general these westward-pitching dikes seem to be much less constant in direction. In the Cary mine, a west-pitching dike cuts through an east-pitching dike, but it is not known if other westward-pitching dikes are younger than those with an east pitch.

Little is known of the relationships of the dikes to the sill. In the Yale mine a single instance was found where a small dike cut through the sill, proving the dike to be the later of the two to be injected into the iron formation. This is shown in Fig. 25. Whether all of the dikes are of later age than the sill, cannot be stated. It is probable that there are dikes of considerably different ages in the iron formation, but on this little evidence is at hand. There are dikes cutting the Keweenawan trap rocks which are thought to be the same as the dikes in the iron formation, indicating that some of the dikes are Keweenawan or later in age. Other dikes and the sill are offset

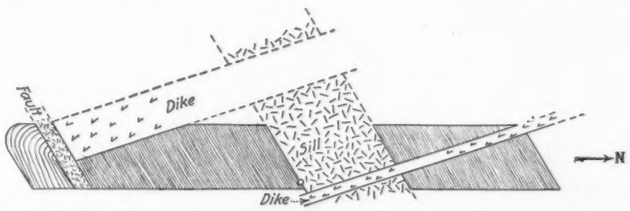


FIG. 25. SKETCH OF WEST SIDE OF CROSSCUT IN YALE MINE, SHOWING SILL CUT BY SMALL DIKE

by those faults which are definitely known to be earlier than Keweenawan, and so must be pre-Keweenawan in age. Further study of the relative ages of dikes is most likely to show that dikes intruded the iron formation at various periods during, and preceding, the volcanic activity of Keweenawan time.

It has been the opinion of some geologists that the openings filled by the dikes were the channels through which the Keweenawan lavas reached the surface, but it seems to me rather improbable that these could have been the main feeders for the lava flows, because of the fact that the iron formation adjacent to the dikes is seldom altered for a distance as great as a foot. Only adjacent to the largest dikes, 50 or 100 ft. in thickness, has the effect of the dikes on the iron formation extended as much as six or eight feet. If these dikes had served as the main channels for the hundreds of cubic miles of lava composing the Keweenawan, it is almost beyond question that they would have altered the iron formation, more particularly the chemically unstable carbonate phases, to a far greater extent than they do. This fact, and the strong evidence that most of the dikes were of an age earlier than the bedding fault, seem to me to indicate strongly that most of the dikes are pre-Keweenawan in age.

Summary of Structural Events

It may be well to summarize at this point the history of the structural incidents in the iron formation and state briefly the evidence which has been given. (1) After the deposition of the iron formation the first event of importance was its intrusion by the great sill. The intrusion of many of the dikes was probably almost contemporaneous with this, and possibly somewhat later, a single instance having been found where a dike cut through the sill. (2) While the beds were still in a horizontal position the bedding fault occurred, cutting the dikes and the sill and shoving the upper beds in an easterly direction. Numerous cases have been found in which the sill and the dikes have been cut by this fault, which, so far as is known at present, is the oldest one on the range. (3) The next event of importance was the development of the great Sunday Lake thrust and the associated crumpling of the beds, which occurred while the formation was still in a horizontal position. After this fault occurred a great erosion interval, during which the whole of the Tyler slate formation was eroded in places east of the Sunday Lake fault. (4) The next event of importance was the development of faults of the Eureka type. This may have occurred either before or after the outpouring of the Keweenawan lavas which make the trap rock range, but it is my belief that these faults probably occurred after the Keweenawan lavas had been extruded. Most probably the iron formation was still in a horizontal or nearly horizontal position at the time this faulting occurred. (5) The next important structural event in the history of the iron formation was the development of the transverse faults. (6) The last structural event was the tilting of the iron formation downward to the north.

These events have been stated in categoric style to point out the trend of the evidence available at present. It must be kept in mind that this simple statement cannot be complete and that events given here as successive may have been almost contemporaneous.

Chronology of Structural Events

Of these structural events, the greater part of the intrusion of the iron formation, the development of the bedding fault and of the Sunday Lake fault, occurred before the Keweenawan lavas were present. The Eureka type faults may have occurred either before or after. The transverse faults occurred after development of the lava flows, and probably before but possibly during the tilting which tipped them to their present steeply inclined attitude.

It is probable that still another structural event occurred in another intrusion by dikes, and that these dikes are the ones which in a few instances have been found to cut into the Keweenawan lava flows. If such dikes exist in the iron formation, however, they should be found to cut through the great bedding fault without being materially displaced, unless later movements along the bedding fault cut them off. No cases of this kind have been identified with certainty so far as the facts are known to me.

(To be concluded)

French Technical Journals

A list of French technical journals, with addresses and terms of subscription, is given below, with the belief that it may be of value to readers of the *Journal*. Many engineers who have served oversea desire to keep up their French, and, at the same time, to keep in touch with engineering matters abroad during the reconstruction period:

L'Echo des Mines et de la Metallurgie, 7, Rue d'Offement, Paris. Subscription (foreign), 55 fr.

La Metallurgie et la Construction Mecanique, 20, Rue Turgot, Paris. Subscription, 25 fr.

La Revue de Metallurgie, 49, Quai des Grands Augustins, Paris. Subscription, 40 fr.

Revue Universelle des Mines, 174, Bould. St. Germain, Paris. Subscription, 40 fr.

Revue Industrielle de l'Est, 40, Rue Gambetta, Nancy. Subscription, 22 fr.

La Technique Moderne, 49, Quai des Grands Augustins, Paris. Subscription, 42 fr.

Le Genie Civil, 6, Rue de la Chaussée d'Antin, Paris. Subscription, 45 fr.

L'Usine, 145, Faubourg St. Denis, Paris. Subscription, 36 fr.

Mine Shafts at Goldfield, Nev.

THE LAGUNA SHAFT OF THE GOLDFIELD DEVELOPMENT CO.

GOLDFIELD MERGER SHAFT, 1,750 FT. DEEP, AND NOW USED FOR DRAINAGE AND DEVELOPMENT

ERECTING ORE BINS NEAR OLD COMBINATION SHAFT OF GOLDFIELD DEVELOPMENT CO.

A Precedent for Engineers

W. L. Saunders, Speaking at Dinner to Herbert C. Hoover, Eulogizes Masterly Executive And Engineering Accomplishments of the Food Administrator in Serving the Cause of Humanity During the War

AN ASSEMBLAGE that crowded the Grand Ballroom of the Waldorf, and that overflowed into the foyer and reception rooms, on Tuesday night, Sept. 16, welcomed Herbert C. Hoover back to the United States. The reception and dinner in his honor were given by the American Institute of Mining and Metallurgical Engineers, who had as guests for the evening many prominent and distinguished citizens.

The dinner and reception were attended by more than 1,200 members and guests of the Institute. Among those invited were A. C. Bedford, J. Parke Channing, Norman H. Davis, Henry S. Drinker, Arthur S. Dwight, John H. Finley, E. H. Gary, George W. Goethals, John Hays Hammond, A. J. Hemphill, Myron T. Herrick, Alexander C. Humphreys, H. H. Knox, Thomas W. Lamont, Pierre Mali, Key Pittman, O. B. Perry, Charles F. Rand, Mark L. Requa, Edgar Rickard, John D. Ryan, Charles M. Schwab, Waldo J. Smith, Henry L. Stimson, Melville E. Stone, Oscar S. Straus, Albert Straus, George Otis Smith, and Robert H. Treman. William L. Saunders, past president of the A. I. M. E., was the toastmaster.

The members of the Institute, their friends and guests greeted with long-continued applause, delivered standing, and amid cheers and "Tigers!" the toastmaster's declaration concerning Herbert Hoover: "Such captains of industry are by education and experience best fitted to steer the ship of state."

Horace V. Winchell, president of the Institute, presided, and before presenting the toastmaster read a score or more of cable dispatches and messages from foreign engineering and civic bodies.

Mr. Saunders' address follows:

This dinner is a simple tribute paid by the family of engineers to one of its masters. He is indeed a master, who, after rising to leadership in his profession, elects to be a servant in the cause of human welfare during a period of great calamity. If there is one reason larger than others for this meeting, it is that we might grasp the hand of our guest and say from our hearts, God bless you, old man. You have done well. We are proud to know you.

As this is a familiar audience to me, suggesting (except that it is bigger) our old Mining Institute dinner days, I am reminded of an incident that occurred up in the iron district of Michigan: A speaker, looking over a familiar audience, began by saying, "Now you know what I am going to say." A large part of the audience cried out "Yes." Whereupon he said, "Well, as you know what I am going to say, I shall not take your time by saying it." He then sat down. Called to his feet again, he repeated the statement, "You know what I am going to say." There were loud cries of "No." He then said, "Will those people in the audience who know what I am going to say please tell those who do not know, and save time for the next speaker?"

Now, as the next speaker is our guest of honor, the logical and popular thing for me to do is to follow the course of my Michigan friend. But in this I am beset with difficulties. The committee in charge of this dinner has overruled its chairman, declining to listen to my argument that a toastmaster at a dinner does not make a speech, but should feature the speakers and not himself. To this they have cruelly replied that everybody knows that toastmasters become so inebriated by the exuberance of their own verbosity that they feature themselves to such an extent that it is hard to even see the features of other speakers, let alone hear their voices.

But you do not know what I am going to say, for this is no ordinary occasion. Never before have men gathered to pay a just tribute of admiration to one who has done the things that this man has done. His work was not built upon precedent; there was no experience, no guide. It was, in fact, a creation. In the words of the Prime Minister of England, his work in Belgium was nothing less than a miracle. Yet it is a fact that those who have been in close touch with the situation say that his greatest work has been done since the armistice was signed.

Truly, this is a period of new things, new changes, new times; a period of agitation which brings to the front new men of true worth. You who are mining engineers know what a good thing the flotation process is, how by violent stirring up of things the metallic values are separated from the gangue and float off at the top. This process has been in action all over the world during the past five years and it has revealed out of the chaos an engineer of the value of pure gold—one

> "Of manners gentle, of affections mild,
> In wit a man, simplicity a child."

A rugged personality, strong of conviction, modest; thinking never of self; practical, far-seeing, wise, human, brave; with a mind clear in action, a conscience that always functions; one who has saved lives while all others were engaged in destroying them; a rare combination of physical, mental, and moral courage; a real American is this Herbert Hoover.

Who's Hoover, any way, and what is a mining engineer, are questions asked by the man on the street. It is easier to answer the first question than the second. Some of you may remember my saying at one of our Institute dinners: If a man goes digging for clams is he mining or is he fishing? Professor Kemp answered it by saying that his professional experience had taught him that the mining engineer is the clam. There is some truth in this jest when we realize that engineers are always digging in scientific fields, giving little thought or time to civic affairs or to human welfare. Huxley has called this a mental twist and he compares it to a ship out of trim because listed by an excess of cargo on one side. Here at last we have the example of an engineer who typifies the modern defini-

tion of engineering which is thus written in large letters on the wall of the engineers' library in New York: "Engineering, the art of organizing and directing men, and controlling forces and materials of nature for the benefit of the human race." How well this modest mining engineer has shown that he has the art of "organizing and directing men"! Of the many thousands working for him, here and abroad, it is said that not only have they given him loyal support, not only are they glad to work for him, but every man of them would take off his coat and fight for him. How well he has shown his capacity for "controlling forces and materials of nature for the benefit of the human race."

This definition of engineering would have been amazing forty years ago. The civil engineer was then a surveyor, a mathematician and a bridge designer; the mechanical engineer an educated mechanic, a designer and draughtsman; the electrical engineer was unknown outside of the school and the laboratory; while the mining engineer was a combination of the geologist and that kind of a chemist who could tell how much phosphorus there was in a steel rail. I make this statement with apologies to Alexander Holley, who in his day was the one and only mining engineer known beyond the fence of the work-shop or mine.

But the engineer is at last coming into his own. We see the dawn of a new day; truly there is a new order of things: The great centers of the world are now industrial centers. The prosperity and strength of nations in peace and war rest now upon the factory system, the shops, the railways and steamships, the mines, the smelters and the public works. And who is responsible for this? Who plans and executes these things? It is the engineer, civil, mining, electrical, mechanical, chemical, and automotive. Such captains of industry are by education and experience best fitted to steer the ship of state. The place for the engineer is not in the dark confines of the hold below, but on the upper deck—yes, on the bridge.

We are told that practically all the executive heads of the organization for the relief of Belgium were engineers. Who but an engineer is as well trained by education and experience to meet emergencies? He must be prepared for extraordinary conditions. He must foresee these conditions and be ready to act quickly. A mine manager—usually a mining engineer—when told that a pump has broken down in the mine, cannot wait for the common remedies, but must provide in advance for experts and appliances to be on the spot at once and cure the trouble promptly. Is not this the one thing above all others which enabled America to play so important a part in the war? Was it not the spirit of the engineer, his capacity to do things and do them quickly?

Surely the war was not won by money, for the enemy was never financially embarrassed. I think we shall all agree that the basic strength of the Allies throughout the war was in the never-dying morale of all the people, including the armies, arraigned against Germany. But what would this strength have availed us but for the resources behind the lines? Modern war resources are mainly coal and iron and the capacity to put these things to practical use on a large scale. The mines would avail little but for the works, and the works might avail little but for the men—the engineers who direct them on modern, scientific lines of high efficiency. Mr. Hoover during the war gave me the first insight into the Battle of the Marne, when he told me that even the Germans underestimated by twenty per cent the volume of munitions required in a modern battle. They drew away too fast from adequate supplies.

And so America, through its engineering and industrial strength, helped to save the world from calamity. Now what individual best exemplifies this? Food played an important part in the war. We have heard the cry that food will win the war. Surely without food no war could be won. It was Mr. Hoover who took care that there should be no food shortage. He did more—he taught thrift to millions of people in all walks of life and in all parts of the world. He preached the gospel of the clean plate. But it is not only in food that our guest stands as an example of achievement; he typifies the engineer, the executive, the man behind the gun. It is easy to see things that lie directly before us, but the best executive is one who builds his fences around the future, who anticipates trouble before it comes.

Little has been said of Mr. Hoover's capacity to think straight in advance, but this is really one of his strongest characteristics. It was first shown when he took charge of the work of sending Americans over when the Great War broke out. His plans were made and negotiations completed with shippers before the organization was made up and before he had any knowledge of how many persons were to go or where the money was to come from. While forming the Commission for the Relief of Belgium, and before he knew who was to pay the bills, he had ordered millions of dollars' worth of food and had chartered ships. When asked why he took such chances he said that it was impossible to believe that the people of the world would not stand behind so wholesome a measure in the interest of humanity, and they did stand behind it nobly and to the end. While Congress was hesitating and amending the Food Act Bill, Hoover was busy organizing every state and territory, even going into counties of each state, so that when the bill was finally passed the machine had been completed and was ready to function. His abiding faith in public opinion is based upon the belief that the people will always support an unselfish effort to do that which is right.

I have said that there was no precedent for the work done by Mr. Hoover. He has established a precedent for engineers, and for us this is one of his greatest acts. I shall not attempt to tell you all that he has done during the past five years. I am incapable of doing so. The things are so big that one stands aghast in studying them. We have long known him as an able and successful mining engineer. He is an honorary member of the Institute. He was the first choice of the nominating committee for president of the Institute in 1914, but asked to be permitted to forego the honor because he felt that it was his duty to help feed the Belgians.

Herbert Hoover is a graduate of Stanford University. He first served with the United States Geological Survey, then went to West Australia and China, in mining activities. His work in London up to the beginning of the world war was notable in that he departed from the usual share-promotion schemes of the mining market, developing the properties in which he was inter-

ested purely on technical lines. He would not countenance any inflation of shares which was not represented in the intrinsic value of the properties. When the war broke out he gave up his management and directorships and steadfastly refused to give any attention to his private affairs during the whole period of the war. He began work the morning after England declared war on Germany, taking charge of the relief of American refugees, advancing funds out of his own pocket, and through his friends, furnishing forty-five thousand people with money and steamer tickets to get home. In October, 1914, he organized the Commission for the Relief of Belgium. Through this source nine million people were continually supplied with food, nearly half of them being entirely dependent upon this relief. There were thirty-five thousand Belgians and French engaged with him in this work. He provided seventy steamers in regular service, delivering 4,500,000 metric tons of foodstuffs. The losses in foodstuffs from all causes from the ship to the Belgian warehouse were less than two-tenths of one per cent. There were 200 American volunteers in this work, serving without salary, most of them paying their own expenses. Eighty per cent of them were university graduates. The total overhead expenses of this commission were less than one-half of one per cent. He was responsible for the expenditure of six hundred and fifty million dollars.

Shortly after America entered the war Mr. Hoover was summoned to Washington to take charge of the food situation here. The problem was a large one, as food demands from Europe were centered upon the United States. His organization in every state and county comprised 8,500 men and women, giving their whole time to the Food Administration. In addition to this there were half a million persons registered and ready to be called upon for emergency work. Twelve million families were pledged to support the work. Of the active workers about one-half were volunteers, the others receiving moderate salaries from the Government. It has been estimated that if these volunteers had received the ordinary Government remuneration of $2,000 per annum the salary bill alone would have been nine million dollars. Most of these volunteers paid their own expenses. Of the paid employees only thirty-four received remuneration of $3,600 per annum or more. It has been estimated that this administration carried out its functions ninety-two per cent by voluntary effort, seven per cent by persuasion and one per cent by legal authority. A conservative estimate of the advertising voluntarily contributed in this work approximates the sum of eighteen million dollars. A voluntary conservation campaign among hotels and public eating places resulted in the first six months in saving the equivalent of about two and a half million bushels of wheat.

During eight and one-half months in the year 1918 more than sixteen and one-half million bushels of wheat were saved by conservation at the mills. It is impossible to enumerate all of the activities of the Food Administration. One of the minor activities was the Grain Thrashing Division, organized for the purpose of helping to eliminate wasteful practices. The expenses of this division amounted to fifty-five thousand dollars, and it has been estimated that the amount of wheat saved was forty-four million dollars.

Immediately after the armistice was signed Mr. Hoover was directed to proceed to Europe to investigate the part that America could play in the relief of the civilian population. Though he had but four days before sailing, he arranged for the purchase and shipment of 250,000 tons of food. It was not until February of the following year that Congress appropriated one hundred million dollars for European relief. At that time several hundred thousand tons of foodstuffs had been actually distributed. Up to a recent date over three million tons of foodstuffs, valued at over seven hundred and seventy million dollars, have been distributed.

This is a brief and altogether inadequate statement of a wonderful record of achievement. Certain things stand out with striking prominence. Mr. Hoover was more than a food administrator. He was a general, an organizer in action. He got men to do things. His faith in the moral support of the people was sublime yet practical. He seemed to know the right methods to follow and the psychological moment to act in order to secure the full measure of support.

And so, dear friend, we welcome you home! We rejoice that your five years of labor have produced so wholesome a harvest. We are glad that you are returning to the practice of your profession. We know that we cannot honor you as you have honored us; but in this inadequate tribute of our love may you find some measure of cheer as you journey to the Sierras and your California home. On behalf of this audience, on behalf of all engineers, on behalf of a war-stricken people, who did not pray in vain, "Give us this day our daily bread"—on behalf of all America, let me say to you in the words of John Milton, Servant of God, well done, well done!

Testimonial to Hoover

AN ILLUMINATED TESTIMONIAL, bearing the autograph of each person attending the dinner given by the American Institute of Mining and Metallurgical Engineers, on Sept. 16, 1919, at the Waldorf-Astoria Hotel, to welcome the return of Herbert Hoover, was delivered to the guest of honor during the dinner. The text of this testimonial was as follows:

"To HERBERT HOOVER the members and guests of the American Institute of Mining and Metallurgical Engineers, assembled to commemorate his return home, extend the *welcome* due an eminent American citizen, a successful Engineer, a Genius of Constructive Administration, a practical Economist, a Statesman of World Vision.

"In him they honor an Idealist who was able to vitalize the Altruism of America and save from Hunger and Anarchy vast areas of Europe where millions of men, women and children in a score of languages lift their voices to call him blessed.

"He is loved and honored for his gift of leadership and inspiration which called many thousands of volunteers to his aid in the great tasks he undertook and accomplished.

"Realizing that no gift of gold or precious stones could convey the deep feeling of appreciation we wish to express, we simply subscribe our names as fellow engineers, co-workers and admiring friends.

"NEW YORK CITY, *Sept.* 16, 1919."

Herbert Hoover's Address at the A. I. M. E. Reception in His Honor

FOLLOWING the toastmaster's tribute, at the reception and dinner in his honor, to Herbert Hoover's great services for America and for the world in the last five years, Mr. Hoover delivered an address, which is here presented in full:

I have been asked to speak to you on some of the impressions that I have gained during my service in Europe since the armistice. Two convictions are dominant in my mind. The first comes from contact with stupendous social ferment and revolution in which Europe is attempting to find solution for all its social ills by practical experiments in Socialism. My conviction is that this whole philosophy is bankrupting itself from a startling quarter in the extraordinary lowering of productivity of industrial commodities to a point that, until the recent realization of this bankruptcy, was below the necessity for continued existence of their millions of people. My second conviction is older but has been greatly hardened, and that is a greater appreciation of the enormous distance that we of America have grown away from Europe in the century and a half of our national existence, in our outlook on life, our relations toward our neighbors, and our social and political ideals. The supreme importance of this Americanism neither permits us to allow the use of this community for experiment in social diseases, nor does it permit us to abandon the moral leadership we have undertaken of restoring order in the world.

During the last ten months I and my colleagues have occupied a unique position in intimate witness of the social currents that have surged back and forward across Europe. The enemy collapsed not only from military and naval defeat but from total economic exhaustion. In this race to economic chaos the European Allies were not far behind. By this exhaustion the whole of Europe stood facing a famine, the like of which has not been seen since the Thirty Years' War, when a third of the population died of starvation. In the midst of all this was the struggle of a score of new democracies to establish themselves, with friction along every frontier, and with the destruction of governmental institutions, without financial resources to buy supplies, with the miseries of their people offering fertile soil for every economic patent medicine and for all the forces of disorder, and Bolshevism and anarchy overhanging all, there could be no hope of restoring normal economic life until the completion of peace. In all this situation, with its desperation, greed, century-old animosities, its idealistic and proper aspirations, there was only one hope. That hope, expressed by every city and state, was that the American people, being the one disinterested and uncrippled economic and political force still existing in the world, should again intervene. It was in response to this call that the President, comprehending the real heart of the American people, intervened in Europe a second time and took those steps which resulted in a practical economic organization of Europe, pending the consummation of peace and the arrival of the forthcoming harvest.

This second intervention was not a relief problem in the ordinary acceptance. It was not a problem alone of finding foodstuffs for starving populations of the ravaged regions. It was the problem of finding a large margin of foodstuffs and other supplies for the whole of Europe—Allies, liberated peoples, neutrals, and enemies; and in a mass of at least 200 millions of these people formerly under enemy domination it was a problem of finding absolute economic rehabilitation. Further than this, it was a problem of warding off Bolshevism on one side and reaction on the other, in order that the new-born democracies could have an opportunity of growth. Its practical consummation was a problem of the organization of the economic strength of the United States and its co-ordination with the remaining economic strength of Europe, and, in large areas, the imposition of absolute dictatorship over economic forces.

Thus, the shipping of the world required sufficient co-ordination to transport thirty millions of tons of supplies from all quarters of the globe to Europe. It required the provision of credits to those countries whose total exhaustion abolished all hope of normal payment. It required the insistence upon payment from those who had gold or commodities. It required sufficient co-ordination of purchase in this vast quantity of supplies that the markets of the world should be affected in the least possible degree. With the dissolution of the organization of the old channels of communication, river craft and railway rolling stock was hoarded by each state; telegraph and postal communications were broken down; every frontier was the scene of more or less military friction, until at one moment there were twenty-five little wars in progress. Many of these new governments were without experience or even without the existence of departments for the conduct of either the transportation or distribution of supplies.

Thus, it was necessary to secure the erection within their governments of actual departments, to furnish them advisors, to take over the actual operation of thousands of miles of disintegrated railway systems, to open rivers and canals for traffic, to stimulate the production of coal and other primary commodities, to control their distribution through large areas, to find a basis for exchange of surplus commodities from one state to another, to exercise the strongest political pressure to obtain the disgorgement of surpluses into areas of famine, to resort to barter on a national scale where currencies had broken down, to stimulate peoples discouraged and disheartened to efforts in their own salvation, and, finally, but not least, to intervene a charitable hand in the saving of their children and the stamping out of contagious diseases, and through all of this economic disorganization to inspire the maintenance of order on one hand and the defeat of reaction on the other. Beyond this again, the necessity of constant friendly intervention in frontier quarrels to prevent the starting of more wars.

These things have not been solved by the service or direction of any one man. They have been accomplished through co-ordination of the men of good will in twenty governments of Europe and throughout by creation of a thread of American personnel, directed from a single center. On our side it has required the co-operation of Congress, the Grain Corporation, the Treasury, the Shipping Board, the Army, and the Navy. A thousand Americans were sent into those communities with but little authority beyond their own assurance and the confidence on all sides that they were disinterested, that their only desire was to solve a great and human emergency for no political and no commercial advantage. It was our desire to do this from the background, without ostentation; to act at all times through established institutions, to build up their strength for the time they must rely upon their own resources. I cannot pay enough tribute to all these thousand Americans, many of them engineers, men taken from the common life of the United States, thrust into the face of staggering political, economic problems, the solution of which must affect the well-being not of hundreds but of millions. The proof of their performance lay in the fact that Europe has come through the most terrible period of its history with no loss of life from economic causes, with a stronger democracy and a glow in its heart for the United States.

This service of the American people has been accomplished at no mean national sacrifice. From the armistice to this year's harvest there has been furnished over two and a quarter billion dollars' worth of supplies, the majority of which has been given freely upon the undertaking of the assisted governments of repayment at some future date. There has been no demand of special security; no political or economic privileges have been sought. It may be years before we receive any return from these loans, but if that period should never come the American people, by this second intervention in Europe, have saved civilization, and have done so with no thought to the burden or cost to themselves. These matters have been brought to a successful close with the arrival of the harvest and the prospect of peace. What the future has a right to demand from us in further economic support is not yet clear, but it is at least certain that if the world cannot quickly secure the settlement of peace and safeguards for the future through the League the whole of our two great interventions will have gone for nothing, and the menace of reaction will again return against us upon the winds of chaos.

As the executive head of this Allied effort in economic control, I have thus had an intimate contact with the common people and their officials. I have witnessed their improving physical condition, the constant change of currents of social, political and economic forces, their revolutions, and I have had to deal ultimately with the results of all these phenomena. During this period since the armistice, we have witnessed social and political revolution among one-third of the civilized world, and we see the remainder in great social tribulation. No contemporary can properly judge or balance the relative volume of great currents of social agitation. They are matters of mind and not of matter. Yet practical statesmanship requires that within our abilities a constant accounting should be taken of the tangible results of these forces abroad, if the development of our liberal institutions and progress of orderly government is to be maintained and revolution avoided.

This cataclysm of social change in Europe is the result of the long culmination of social as well as political wrongs; it is no sudden afterthought of war. These forces were projected into actual realization by the collapse of the war, the breakdown in the political institutions that had preceded it, and the misery that has flowed from it. Our soil is not so fertile as that of Europe to many of these growths, because we have a larger social conscience. We have not the vivid class and economic distinctions of Europe, nor have we the depth of misery out of which these matters can crystallize. Nevertheless, in these days of intimate communication, social forces are rapid in their penetration and social diseases are quick in universal infection.

The general revolution of Europe of the last century, starting with the French Revolution, profoundly changed the whole social order of the world, and, while in that revolution the spiritual impulse was the demand for political liberty, there was also a great economic impulse. That economic impulse was primarily the division of the land, and one of the fruits of that revolution was the better distribution of wealth among the agricultural population. Since that time an enormous expansion of mechanical industrialism has been superimposed upon all agricultural states, with a large increase in urban populations. The economic impulse of the revolution to-day is the demand for a better division of the wealth from this industrialism, and this time the agitation arises mainly from the urban population.

These vast masses of humanity in Europe have long been groping for the method of nearer equality of opportunity and better distribution of the results of industrial production. These gropings and these attempts have in recent years been dominated by Marxian Socialism, developed in different degrees of intensity. Broadly, these revolutions have taken two forms: the Bolshevik form, through which there has been overnight communization of all property, and second, the milder form of legislative nationalization of industry. I believe we are now in position to take some stock of and to form some judgment as to the adequacy of these solutions for what I believe every liberal-minded man believes is a necessity—the better division of industrial production.

We require only a superficial survey to see that the outstanding and startling economic phenomenon of Europe today is its demoralized industrial production. Of the 450 million people in Europe, a rough estimate would indicate that they are at least 100 million greater than could be supported on the basis of production, which has never before reached so low an ebb. Prior to the war, this population managed to produce from year to year but a trifling margin of commodities over the necessary consumption and to exchange for supplies from abroad. It is true that in pre-war times Europe managed to maintain armies and navies, together with a numerically small class of non-producers, and to gain slowly in physical improvements and investments abroad, but these luxuries and accumulations were only at the cost of a dangerously low standard of living to a very large number. The productivity of Europe in pre-war times had behind it the intensive stimulus of a high state of economic discipline, the density of populations at all times responded closely to the resulting volume of production. During the war, the inten-

sive organization of economy and consumption, the patriotic stimulus to greater exertion and the addition of women to productive labor, partially balanced the diversion of man-power to war and munitions. Both the pre-war and the war impulses have now been lost, and the productivity of Europe has steadily decreased since the armistice.

It is true that some of this diminution in production has been contributed to by the other factors, but in the larger degree the cause of this steady decrease of productivity, with its shortage of necessary supplies and its rising cost of living, must be sought in the social ferment, with its continuous imposition of Socialistic ideas. In this ferment the advocates of Socialism or Communism have claimed to alone speak for the downtrodden, to alone bespeak human sympathy, and to alone present remedies, to be the single voice of Liberalism.

We may examine these phenomena a little more closely. In Russia we have a great country in which the population, with the exception of a small minority, were comparatively well fed, warmly clothed, and warmly housed. They were subject to the worst of political tyranny, were deliberately steeped in ignorance and superstition, yet their productivity was sufficient to enable them to provide these primary comforts and to export more foodstuffs than the United States. Socialism was brought in overnight at the hands of a small minority of intellectual dilettantes and criminals, and this tyranny of minority, more terrible even than the old, has now had nearly two years in which to effect the conversion of the wicked competitive system into the Elysium of Communism. Today two-thirds of the railroads and three-fourths of the rolling stock that they control are out of operation. The whole population is without any normal comforts of life and plunged into the most grievous famine of centuries. Its people are dying at the rate of hundreds of thousands monthly from starvation and disease. Its capital city has diminished in population from nearly two million to less than 600,000. Prices have risen to fantastic levels. The streets of every city and village have run with the blood of executions, nor have these executions been confined to the so-called middle and upper classes, for latterly the opposition of the workmen and farmers to this regime has brought them also to the firing squad in appalling numbers.

If we examine the recent proclamations of this group of mixed idealists and murderers, we find a radical change in their economic and social ideas. They have abandoned the socialization of the land, for they find the farmer will not produce for payment in high-flown and altruistic phrases. They have re-established a differential wage in an attempt to stimulate the exertion and ambition of skilled labor. They have established a State Savings Bank, in order to stimulate production through making provision for family and old age. They are offering fabulous salaries for men capable of directing the large agencies of production. In fact, while in the midst of flowery verbal endeavor to maintain that they are still Socialists, they are endeavoring to restore individual ownership of property and of the results of labor. The very High Priest of Socialism is today vainly endeavoring to save his people from their total destruction by summoning back the forces of production. The apologists of this debacle are telling us that it is due to the Allied blockade, and to various other oppositions, but any one with a rudimentary knowledge of Russia knows that they did have within their borders ample supplies of food, coal, oil, wool, flax, cotton, and metals and the factories with which to work them in abundance, and that their sole deficiency is human effort.

We could take another example of Bolshevism in the efforts of Bela Kun and his colleagues in Budapest. The distinction between this situation and Russia is that they were dealing with a population of much higher intelligence, of much higher average education, and it required but three months for the working people of Budapest to realize the fearful abyss into which they had been plunged. It was solely due to the efforts of the trade unions in Budapest that the Bolshevists were thrown out of Hungary.

These are the extreme points where Socialism has had its opportunity for immediate and wholesale application, according to all of the precepts of its advocates. Elsewhere in Europe Socialism has proceeded through established institutions, and we may shortly examine the results here also.

During the war large measures were taken on both sides of the front to secure the mobilization of production and distribution to its maximum use in the struggle. There was effective socialization of vast sections of industry. These measures are being continued and extended today in many places by governments anxious to maintain the stability of institutions, even at the sacrifice of economic safety, but under the threat of minorities of revolutionary action. Yet here again the same prime weakness has proved itself. The only partial success of these measures in war was due to the great patriotic impulse of war. Those who conducted these large operations were men whose initiative and capacity had been selected by the competitive system. These war impulses have been lost, and these organizations with constantly decreasing efficiency even in war now face disaster from further reduced productivity. All these decreases have immediate results in a rising cost of living or the necessity of governments to subsidize commodities—such as bread. There is no better example of this than the coal industry of Europe, and even omitting Russia, this production has fallen from a rate of 600 million tons per annum at the armistice to a rate of 450 million tons recently.

The coal industry is in modern life the very life-blood of the state, and it has proved itself the most susceptible among all the industries to these influences, and its production today is at such an ebb as to jeopardize the entire social fabric. I am convinced that the greatest proportion of European leaders of Socialism today to some extent realize this bankruptcy, and are today endeavoring to cover a retreat with loud complaints as to the failure from other causes. Nevertheless, the realization itself is a great step and is bringing the turn of the tide, and through it Europe is on the road to economic recovery—if she gets peace.

The whole of these various sorts of Socialism are based on one primary conception, and that is that the productivity of the human being can be maintained under the impulse of altruism and that the selection of the particular human for his most productive performance can be made by some superimposed bureaucracy. Their weakness is the disregard of the normal day-to-day primary impulse of the human animal, that is,

self-interest for himself or for his family and home, with a certain addition of altruism varying with his racial instinct and his degree of intelligence. They fail to take into account, also, that there is but one sufficiently selective agent for human abilities in that infinite specialization of mind and body necessary to maintain the output of the intricate machinery of production, and that is the primary school of competition.

My emphatic conclusion is, therefore, that Socialism as a philosophy of possible human application is bankrupt.

Although Socialism has now proved itself with rivers of blood and suffering to be an economic and spiritual fallacy and to have wrecked itself on the rock of production, I believe it was necessary for the world to have had this demonstration. Great theoretic and emotional ideas have arisen before in the world's history and have, in their bankruptcy, deluged the world with fearful loss of human life. A purely philosophical view might be that these experiences are necessary to humanity, groping for something better. It is not necessary, however, that we of the United States, now that we have witnessed these results, plunge our own population into these miseries and into a laboratory for experiment in foreign social diseases.

Bankruptcy of the Socialistic idea, however, does not relieve us from the necessity of finding a solution to the primary question which underlies all this discontent. That primary question is the better division of the products of industry and the steady development of higher productivity. This bankruptcy of the Socialist idea should, if reaction is to be prevented, return the guardianship of this problem from the radical world to the liberal world of moderate men, working upon the safe foundations of experience.

The paramount business of every American today is this business of finding a solution to these issues, but this solution must be found by Americans, in a practical American way, based upon American ideas, on American philosophy of life. A definite American substitute is needed for these disintegrating theories of Europe. It must be founded on our national instincts and upon the normal development of our national institutions. It must be founded, too, upon the fundamental fact that every section of this nation, the farmer, the industrial worker, the professional man, the employer, are all absolutely interdependent upon each other in this task of maximum production and the better distribution of its results. It must be founded upon the maximum exertion of every individual within his physical ability and upon the reduction of waste both nationally and individually. We can well see a vivid confirmation in Europe of the fundamental economic principle that the standard of living and the cost of living is the direct quotient of the amount of commodities produced; that we must secure a maximum production of the industrial machine if we wish to keep our population alive or if we wish to see an increase in the standard of living of our people. From this only can arise the very foundations of the higher activities of life. The application of this proposition must, however, stand several tests. A maximum production can only be obtained under conditions that protect and stimulate the physical and intellectual well-being of the producer. We shall never remedy justifiable discontent until we eradicate the misery which the ruthlessness of individualism has imposed upon a minority.

If I were thinking aloud I would say at once that this maximum production cannot be obtained without giving a voice in the administration of production to all sections of the community concerned in the specific problem; that it cannot be obtained by the domination of any one element. I would say that the human race had increased its standards of productivity and therefore of living through the growth of extraordinarily intricate organization of production and distribution based upon stimulation of the individual by the reward it offers. I would also say that it cannot be obtained from the destruction or sudden disturbance of this delicate and intricate organization of production and distribution or extravagance in its products. I would say the road lies along the better division of the more exorbitant profits that arise from these processes and that have accumulated from them. By better division of profits, I do not refer particularly to profit-sharing schemes but to the broad issue of the whole social product. Some are comparatively overpaid, and many comparatively underpaid, for the service they render to the community. Our organization in many aspects is not all that we could desire, but it is the best we have been able to evolve over thousands of years, and the destruction of these processes or of the organization which conducts them has been demonstrated to be the sure road to destitution and fearful loss of life.

It is not that we today have suddenly awakened to this necessity for better distribution of profits. The social conscience of this country has been manifesting itself continuously concerning this matter for years. We have in the United States today a better division of wealth and a greater equality of opportunity than any other nation in the world, and we have thus better foundation upon which to build. We have reason for discontent in the fact that our industrial development has outrun our social progress, and we have reason to hasten those measures that lead to larger justice in distribution of these profits, larger representation of all elements of the community in the control of these agencies to further strengthen our measures for the restraint of economic domination by the few and for the liquidation into the hands of the many of the larger industrial accumulations in the hands of the few that our rapid development has made possible.

Again I wish to repeat, the observation of these forces in Europe has reinforced my Americanism during these last ten months of intimate contact with them; it has revealed to me the distance of our departure from the political, social, and economic ideals of Europe. There has grown in this United States a higher sense of justice, of neighborly service, of self-sacrifice, and, above all, a willingness to abide by the will of the majority in every section of this community. This Americanism is the guarantee of the ability of our people to solve this most momentous internal problem confronting our generation. But these very ideals, this very sense of justice and service for our own people, gives us still further opportunities.

Our sister civilization in Europe is today recovering from a great illness. The many new democracies that we have inspired are striving for our ideals. We alone have the economic and moral reserve with which to carry our neighbor back to strength. To do this is also true Americanism.

CORRESPONDENCE AND DISCUSSION

Letters From the Mining and Metallurgical Industry Dealing With Pertinent Subjects of Interest

Engineering, Latin and Greek

In the *Journal* of May 17 an editorial entitled "Engineering, Latin and Greek," caught my eye because I have always held some decided views as to the study of the dead languages, and have been on the lookout to find someone who can persuade me that the years devoted to these subjects were not so badly spent as they seem. The only encouragement which I am able to gather from this editorial is that my knowledge of these languages should make me better able to converse with other men who have acquired the same. Of course, this might be said about the study of any other topic, or about any experience, particularly of travel. As I have never noticed myself taking advantage of this prerogative, probably I have thrown away a valuable opportunity.

As the editorial asks for expressions of opinion, I venture to offer such an expression. To acquire my training in Latin, which was no more than what all of us took to pass the college entrance examinations in advanced Latin, necessitated spending an average of ten hours a week, counting home work and class-room recitation, for forty weeks a year for six years, or 2,400 hours. This is equivalent to a modern workingman's year of forty-eight hours a week for fifty weeks, so here is a solid year sacrificed on the shrine of one dead language. Still I am trying to discover any benefit which may be considered worth a fraction of the cost, or which can be compared with the benefit which might have been derived from the same amount of time spent doing innumerable other things which I would have liked to do, but could not do because of lack of time.

The only language to which I can point as an undoubtedly good investment was the eleven weeks' course in Spanish, of one lesson a week. No credit was allowed, because Spanish is not one of the classical languages, but it was the most valuable course for the time spent which I ever took, and was far more practical than any of the other languages, all of which required many times the work. My Greek is of value in that it is handy to be able to pronounce the Greek letters we meet in mathematical equations and in astronomy, but this could be learned in a couple of hours. Also, all the Latin suffixes and prefixes could be learned in a similar time, and that is about the extent of the use of Latin.

If anyone should ask you why hundreds of thousands of youths of the country are forced to spend millions of hours annually wearing out their brains and loading them with stuff that is only to be forgotten, you may tell them, if you want, that this is culture, and we must all be cultured. But if you want to get to the bottom of the truth you should say that the real reason is that some of our most aristocratic universities require it for entrance. Therefore other colleges, not wanting to be outdone by these, also require it, and so preparatory schools must teach it. You may ask why these more aristocratic universities require it, if it is not worth while. The answer is that the "powers that be" at these colleges grew up in an age remote from these times. They despise modern "break-neck" tendencies and practices; in fact, they personally never took much to sciences, but preferred literature. They value much more the qualities which their own professors admired. They can point out that all the great men of former times studied Latin, and therefore so long as they are on the board of directors they will fight to keep Latin and Greek in their honored places.

ARTHUR O. CHRISTENSEN,
Harvard, 1906, and M. I. T., 1908.
Franklin, N. J., August 8, 1919.

Estimating Screen Efficiency

The article "Estimating Screen Efficiency," by W. O. Borcherdt, in your issue of April 12, interests me strongly, because the points raised are similar to those affecting the problem of estimating the efficiency of ore dressing in general, which I have been studying.

Problems of this kind are half solved when they are correctly stated, and their difficulty is due to want of clarity in this respect more than to anything else. For instance, Mr. Borcherdt continually refers to the efficiency of a screen, when what he is really writing about is the efficiency of an operation of screening. The efficiency of a screen per se is always 100 per cent; it will pass the whole of its undersize if you shake it long enough. But in practice perfection must be sacrificed to other and generally sordid considerations. Usually, the actual result obtained depends on the physical nature of the material screened. That with a high percentage of oversize is less easy to screen than material containing a low percentage, and the most difficult is that with a high percentage just a little larger than the mesh aperture. So it is with ore dressing: some ores are easier to dress than others, though, in theory at least, perfect separation of valuable content and waste could be made by an infinite series of repetitions, and only then.

I do not wish here to enlarge upon the derivation and use of the formulas I have devised for arriving at the absolute percentage efficiency of an ore-dressing result; anyone interested in the matter can look it up in the September, 1918, issue of the *Mining Magazine*. The point I want to make now is that both problems are similar, in that they are concerned with an attempt to express the efficiency of an operation aimed to separate, more or less completely, two different entities, waste and valuable matter in the one case, and undersize and oversize in the other.

I consider that my method of solving the ore-dressing problem is applicable also to screening. As a matter of fact it is unnecessary to use it in this way, for a simpler method is possible, but I want to do so here as a check.

Let the true percentage of undersize in the material

treated be 40 per cent, and of oversize 60 per cent, of the total weight. Let the percentage of undersize obtained in a particular operation of screening be 30 per cent (of the total weight of the feed, be it understood) and of oversize 70 per cent.

Then,

a = *per cent oversize in feed* = 60.0 *per cent.*
b = *per cent undersize in undersize* = 100.0 *per cent.*
c = *per cent of undersize in oversize* = 14.3 *per cent.*
A = *weight of feed* = 100.0.
B = *weight of undersize* = 30.0.
C = *weight of oversize* = 70.0.

and the percentage efficiency of the operation equals

$$100\times\frac{\left(\frac{b}{a}-1\right)\frac{100(a-c)}{b-c}}{100-a}=100\times\frac{\left(\frac{100}{40}-1\right)\frac{100(40-14.3)}{100-14.3}}{100-40}$$

$$=75 \textit{ per cent}$$

This is a very involved way of arriving at the same result as that given by

$$\textit{Per cent efficiency} = \frac{100\times \textit{undersize obtained in operation}}{\textit{true undersize}}$$

One difficulty which has prevented the solution of the ore-dressing problem is the general failure to recognize that though ore dressing is usually thought of as an attempt to obtain as large a percentage of the valuable matter as possible in a condition as free as possible from waste, it may equally as well be considered an attempt to obtain as large a percentage of the waste as possible in a condition as free as possible from valuable matter. The mathematical treatment from either standpoint should arrive at the same result.

So, with screening, the efficiency of the operation is the same whether considered from the point of view of undersize or oversize, and here I take issue with Mr. Borcherdt.

Considering the oversize as equivalent to the valuable mineral in the ore-dressing formula, one can state, from the same data as before,

a = *per cent oversize in feed* = 60.0 *per cent*
b = *per cent oversize in oversize* = 85.7 *per cent.*
c = *per cent oversize in undersize* = 0.0 *per cent.*
A = *weight of feed* = 100.0.
B = *weight of oversize* = 70.0.
C = *weight of undersize* = 30.0.

Per cent efficiency =

$$100\times\frac{\left(\frac{b}{a}-1\right)\frac{100(a-c)}{b-c}}{100-a}=100\times\frac{\left(\frac{85.7}{60}-1\right)\frac{100(60-0)}{85.7-0}}{100-60}$$

$$=75 \textit{ per cent}$$

the same result as before, and *not* the same result as would be given by the formula

$$\textit{Per cent efficiency} = \frac{100\times \textit{true oversize}}{\textit{actual oversize}}$$

for which formula I can see no justification whatever.

So that, having subjected the above form of mathematical treatment of a kindred problem to searching analysis, I am satisfied that the absolute percentage efficiency of an operation of screening is given by the formula

$$\textit{Per cent efficiency} = \frac{100\times \textit{undersize obtained}}{\textit{true undersize}}$$

W. O. Borcherdt states that he does not believe it possible to make comparisons of two screens operating on different feeds or on the same feed at different rates. This is equivalent to saying that it is not possible to make comparisons between the results of two different processes of ore dressing on different ores, or on the same ore where rates of feed, or point of division between concentrate and tailing, or some other variable differs in the two cases. But this is just what the type of formula I have introduced does make possible. But, mark, it is only the results actually obtained which are thus rated. One is better than another by a definite degree, but this is not to say that the relation would be preserved with the same ore and the same process in each case, if the rate of feed or some other variable was altered. The reason this limitation exists is because it is impossible to equate a curve from a knowledge of only one point on it. If the general equation of the curve is known, then the knowledge of the coordinates of one point enables those of any other to be calculated, but the characteristic curve of an ore-dressing or screening operation is not known, and probably never will be.

R. T. HANCOCK.

Jos, Northern Nigeria, June 15, 1919.

Recent Metallurgical Progress

American engineers, especially those of us who have followed the various phases of the flotation litigation, have read with particular interest the references to flotation in Mr. Picard's recent presidential address before the Institution of Mining and Metallurgy of London, excerpt of which was published in the *Journal* of July 12, 1919. Mr. Picard has condensed so large an amount of metallurgical information into the space at his disposition that one should commend rather than criticise his accomplishment in this respect. There is, however, one sentence of about six lines which, in respect to its degree of condensation, challenges one's attention. This sentence says: "With later discoveries as to the partial solubility of essential oils, of the beneficial effect of certain insoluble oils in 'stabilizing' the froths and of sub-aëration procedure, the elimination of any need for pulp-heating, or in many cases for acidification, together with the use of alkaline circuits, etc., modern flotation has made remarkable advances."

It is to be wondered how many of Mr. Picard's hearers recognized in the casual references contained in this short sentence the description of three additional Minerals Separation patents! They are the so-called "soluble frothing agent" patent, the "in-the-cold and without-acid" patent, and the "sub-aëration."

One may rightly question whether the writer of the above condensed sentence may not have subconsciously concluded that the features so casually referred to in this sentence were, as in reality they actually are, merely those factors which are "So varied," yet factors of one and the same process. The U. S. Supreme Court, in its Butte & Superior decision, declared Minerals Separation patent 835,120 to be an improvement upon the Cattermole process. It would appear, therefore, that the reagents of the Cattermole process would be also the reagents of 835,120. In this connection, Mr. Picard's statement as to the "dual part" played by certain oils, as well as his allusion to the solubility of oleic acid, becomes of particular interest, and one wonders if these patents, so casually here referred to, can ever be sufficiently differentiated from 835,120, and therefore, also, from the Cattermole, to meet the standard of invention which would be applied to them, should they eventually come before the Supreme Court.

Philadelphia, Aug. 15, 1919. C. H. HALL.

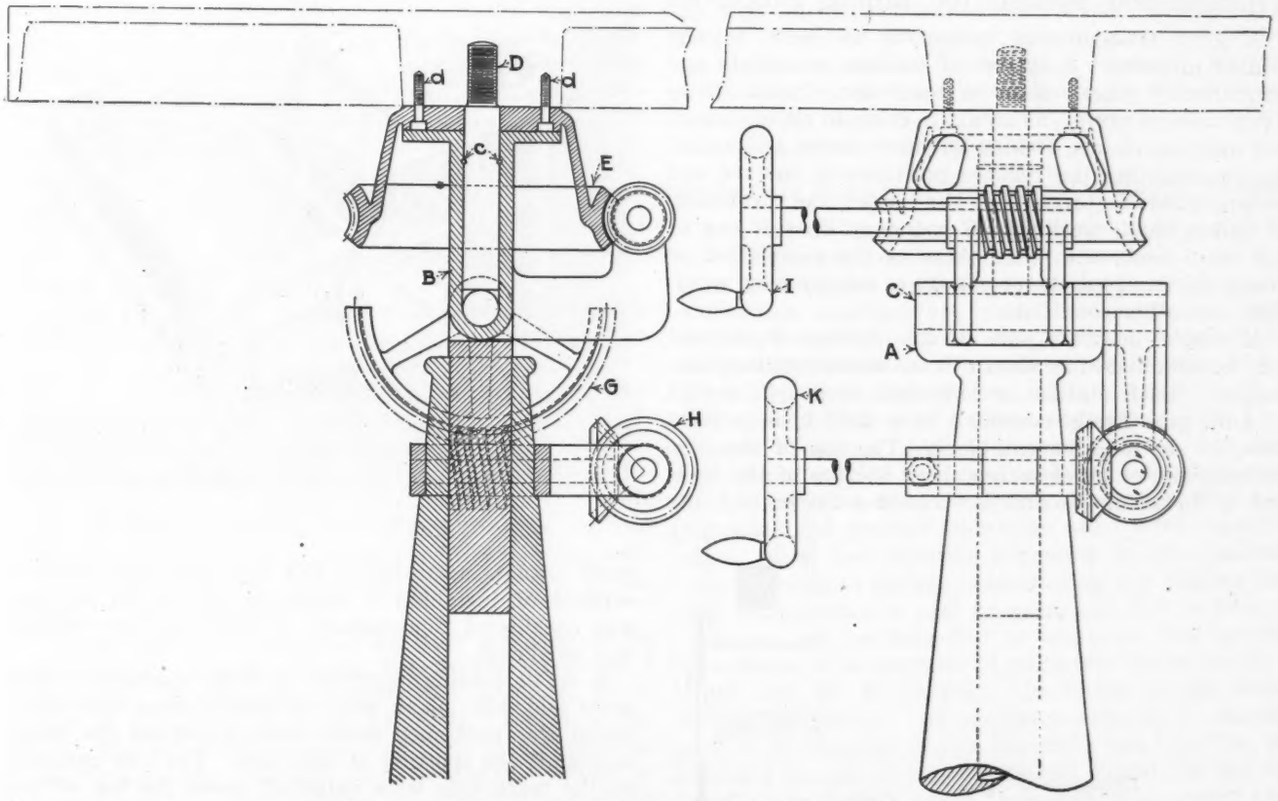
DETAILS OF PRACTICAL MINING

Suggestions From Practice for the
Superintendent, Foreman,
and Miner

Improved Tipping Device for Oxy-Acetylene Welding Table

BY J. T. SMOODY

The utilization of oxy-acetylene welding machines in shop practice is increasing, and during the last few years their adoption at mines has been fairly general. The many repairs necessary to pumps, mine cars, hoisting machinery, and other mine equipment make the oxy-acetelene torch an invaluable asset to the mine shop equipment, and it is believed that a description of the following tipping device for use in connection with an oxy-acetylene welding table will be of interest.



DETAIL OF TIPPING FOR OXY-ACETYLENE WELDING TABLE

The type of table commonly used for welding small and medium weight castings was designed by the Autogeneous Welding Equipment Co., and was described in *American Machinist*, July 8, 1909. The device consists of a cast-iron base, having a 2⅛-in. diameter cored hole in its center. The base supports a ball-and-socket joint, to which the table is fastened by means of four cap bolts. The socket is made with a small base on the side and hollowed out at the top, providing a bearing in which the ball-and-flange connecting neck rests when the table is in a vertical plane. This description is sufficient to show that the idea is to enable the operator to move the table in any plane. When the break in a casting is such that it cannot be welded when placed in a horizontal plane, the broken pieces may be clamped to the table, which is adjusted to the proper plane, thus eliminating the blocking of the casting, which always consumes valuable time. When the desired plane has been found, and while one or two men hold the table, the third tightens the set-screws tapped in the socket to hold the table firmly while the casting is being welded.

The fact that it takes more than one man to operate the table makes its use objectionable where time is an important consideration. Another objection is that the ball-and-socket joint, when worn and slightly spread, cannot be held in place securely. The accompanying sketch shows a device that I have developed to overcome the above objections and save time in the adjustment of a welding table.

The yoke casting *A* is placed in the cored hole of the table base and the yoke in turn supports a three-way socket *B*, which has a vertical and horizontal pin running through it. The horizontal pin *C* is driven in tight and pinned on, whereas the vertical pin *D* is loose, and is held in place by two small pins *c*. The top end of the socket *B* has a flange on which the

horizontal worm wheel *E* rotates. This wheel is bolted to the table by four flat-head cap screws *d*. The upper end of pin *D* is threaded, so that it can be screwed to the table, preventing the table from being pulled out when in a vertical position.

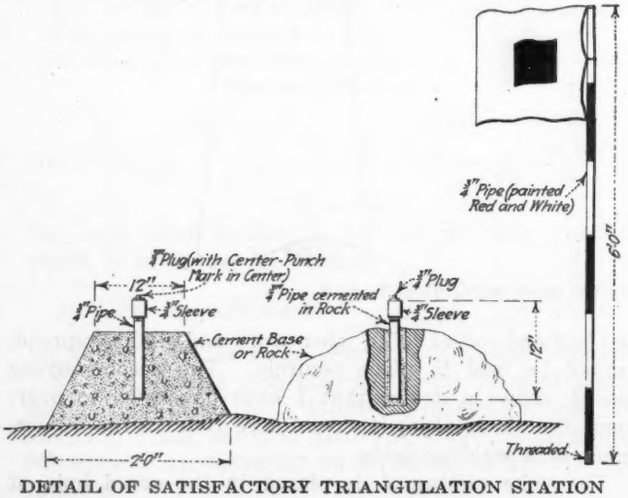
The vertical worm wheel *G* is used to obtain a vertical position of the table, and is fastened to the horizontal pin *C*. The bevel gears *H* are used to place the two hand wheels *I* and *K* on one side of the table, a feature that enables the operator to have easy control of the adjustments. The other parts shown are accessories for holding the members together.

By means of the device the objectionable points are overcome and the advantage is obtained that there is a positive lock from the worm gears, and a one-man adjustment, with the result that there is no chance of the table slipping during the welding. Though the cost of this arrangement is considerably above that of the table without the device described, the time saved in welding castings will quickly pay for the additional expense.

Triangulation System for Mining Properties

A good triangulation system is an asset to any mining property. A system of stations accurately and permanently placed may be used as a basis for a topographical survey, as an aid in tying in claim corners and outlying claims, staking out new claims, and assisting in obtaining the relative positions of surface and underground features. Of the latter the proximity of underground workings to boundary lines is one of the most important; then there is the correlation of geological features, the proximity of nearby mine workings, and other conditions.

A simple, accurate and durable system of stations may be established as shown in the accompanying illustration. Each station is composed of a 1-ft. length of ¾-in. pipe firmly cemented in a drill hole in solid rock, or set in a cement block. The top of the pipe projects two or three inches above the top of the base, and is threaded. To this is screwed a sleeve, and into



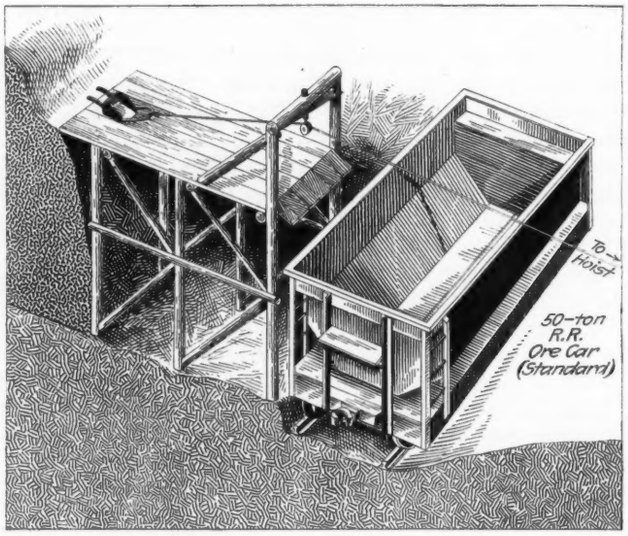
DETAIL OF SATISFACTORY TRIANGULATION STATION

the sleeve is screwed a plug with a center-punch mark accurately placed in the center of the top. This mark gives the exact spot over which a set-up may be made. For backsighting on other stations at a distance, flags are used. The flag is made of a 6-ft. length of ¾-in. pipe, painted alternately red and white in 1-ft. lengths, and to this is tied a red and white square of cloth. Any other conspicuous combination of colors may be used. The pipe is threaded at the lower end, and can be screwed into the station-pipe sleeve instead of the plug. It is not advisable to leave the flags up all of the time, on account of wear and tear due to weather, but such as will be needed can be put up by a helper before work is started. This system is in use at several mines, and has proved quite satisfactory.

Loading a Stockpile With a Scraper

BY D. E. A. CHARLTON

A device which was used in loading a small iron-ore stockpile on one of the Minnesota ranges is illustrated in the accompanying sketch. Little ore was stocked in the winter, and the entire tonnage contained in the mine was removed during the following shipping season. The ore hoisted in the summer was dumped from the skip into a loading pocket and thence drawn off into standard railroad cars. The stockpile tonnage was



LOADING A STOCKPILE WITH A SCRAPER

small, amounting to only a few thousand tons, and the expense of installing a steam shovel for its removal was considered unnecessary, so the following method was employed:

A small loading platform of 8-in. diameter round posts and 2-in. plank was constructed near the track, which was continued some distance beyond the shaft to permit the spotting of coal cars. The two uprights on the track side were extended above the top of the platform and connected so that they formed a frame, from the center of which was suspended a small block pulley. The platform was about three feet above the top of the cars, but sloped on the outer edge so that the ore would run into the cars. An ordinary road scraper was used, fastened to ½-in. cable, passed through the pulley and attached to a small hoist, which was furnished with steam from the boiler house. The far side of the stockpile was removed first. The operation of the scraper required two men. When about half of the pile was moved, the grade became too steep, and it was necessary to provide a small incline to secure the remainder of the ore. All material, with the exception of the scraper and the pulley, was in stock at the mine, and the entire rigging was built at slight expense.

Institute Meeting Opens at Chicago

Engineers in Large Numbers Register at Convention Headquarters at Congress Hotel—Proceedings During First Three Days Marked by Spirited Discussions—Question of Mine Taxation Receives Consideration

WITH the opening of the semi-annual convention of the American Institute of Mining and Metallurgical Engineers in Chicago on Sept. 22 another chapter in the history of the Institute was begun. When the A. I. M. E. meeting was held in New York last February, the signing of the armistice was so recent an event that it was not possible for the engineers to enter into the proceedings as wholeheartedly as they are doing at Chicago. The questions before the present meeting are of vital importance to the country's industrial progress. About 1,000 persons, coming from every American mining center, are expected to register during the five-day session.

MINE TAXATION

How to tax the country's mines and at the same time make a fair allowance for the wasting assets of the industry, was the subject of a spirited discussion on the opening day between Government agents and mining men qualified to talk on the question. The result of the mine-taxation meeting was a decision to secure close co-operation between the Government and the taxpayer, with the mine owner and mining engineer assisting the former in determining the basis of taxation. Dr. L. C. Graton heads the Government representatives.

A. S. Learoyd, of the U. S. Fuel Administration, in his paper presented at the first session, said that in case of future rationing of anthracite coal, the same system will probably be used as was employed last winter. E. C. Harder and D. F. Hewitt, of the U. S. Geological Survey, in another paper, outlined the extent of the country's newly developed manganese resources. The advantages of physical examination of employees and of certain methods of curtailing forces without unstabilizing labor or business conditions in the community were pointed out by Charles F. Willis, of the Phelps Dodge Corporation.

There were also numerous business sessions on the opening day. In the evening the delegates met for a smoker at the Chicago University Club. Dr. F. G. Cottrell, George S. Rice, and Frank H. Probert, of the U. S. Bureau of Mines, recounted their observations on their recent trip through the devastated regions of France and displayed pictures showing present conditions in the various mining and metallurgical districts.

IRON AND STEEL SESSION OPENS ON SECOND DAY

Sessions on "Iron and Steel" were scheduled for the second day of the convention. Among the papers presented were the following: "Blast-Furnace Refractories," by Raymond M. Howe; "Effervescing Steel," by Henry D. Hibbard; "Aircraft Steels," by Albert Sauveur; "Determining Gases in Steel and the Deoxidation of Steel," by J. R. Cain; and "Effect of Time and Low Temperature on Physical Properties of Medium-Carbon Steel," by G. A. Reinhardt and H. L. Cutler.

Moving pictures of the largest plate-rolling mill in the world were shown the members in connection with a business session that lasted throughout the evening. The rolling mill shown is capable of turning out a 240-in. plate.

At the session on "Oil" at the Congress Hotel on the same day, a paper by Dr. Charles Baskerville on "The Value of American Oil Shales" was presented, in the course of which was reiterated the statement that petroleum production in the United States is lagging behind consumption. Dr. Baskerville also said, "The annual production of crude petroleum of 300 million barrels will require a material addition to keep the 477 refineries in operation up to their capacity of 490 million barrels annually. Hence, new oil fields or new sources of crude oil, or both, must be developed. In view of the recent variety of flamboyant advertisements in connection with the shale-oil industry, I hope the Institute will take adequate steps to safeguard, as well as foster, a promising industry. It is no business for an individual who expects quick returns."

THIRD DAY MARKED BY NUMEROUS TECHNICAL SESSIONS

Sessions on "Iron and Steel," "Sulphur in Coal," and on "Mining and Local Resources" were held in the forenoon on Sept. 24, at the Congress Hotel, which was the convention headquarters. At the session on "Coal" attention was focused on the need of improving coal production by better utilization of the supply, and of providing more coal of low sulphur content. E. A. Holbrook, acting chief mining engineer of the U. S. Bureau of Mines, said in his paper that a few years ago 40 per cent of the coal mined was wasted by rejection in the mine or in the setting aside of smaller sizes. Research and greater knowledge are needed regarding costs, rates, and markets, according to Mr. Holbrook.

A warning to the gas industry that low sulphur coals will become scarcer year by year, and that in time the industry will be compelled to use coals that are now considered of no commercial value, was issued by W. W. Odell and W. A. Dunkley, the latter of the Illinois Geological Survey. At another session E. F. Boericke and T. H. Garrett, of the Mineral Point Zinc Co., predicted a growth in importance and output for the Wisconsin zinc district, which they said has in recent years increased its output about 1,300 per cent.

There were also business sessions on Sept. 24 in addition to an extended symposium on non-ferrous metallurgy that was held in the Coliseum in conjunction with the Chemical Industries Exposition. In all 145 subjects are being presented during the week's meeting, the largest number in the history of the Institute.

Charles M. Schwab, General Leonard Wood, and Horace V. Winchell, president of the Institute, were the principal speakers on the program for the banquet on the evening of Sept. 24. The president's reception preceded the banquet. The latter event was followed by dancing in the ballroom of the Congress Hotel.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

War-Minerals Relief

The investigatory work in connection with the War-Minerals Relief Act which has been conducted under the direction of J. E. Spurr is far in advance of the decisions by the War-Minerals Relief Commission. Engineers' reports to the number of 150, and 144 auditors' reports, have been tured over to the commission. Seventy-four claims have been analyzed by the chief auditor and chief engineer and reviewed by Mr. Spurr and placed before the commission. In every case where a "request or demand" on the part of one of the Government agencies named in the act is alleged, it has been made the subject of a special inquiry by the investigations division. This work has been carried on by twelve engineers and nine auditors in the field, in addition to the force in the offices at Washington.

Now that the methods of examination have been reduced to a clearly understood system, and with the experience which the force of engineers and auditors has had, it would be possible to carry the work on more rapidly should that become necessary. It is probable, however, that only the present rate will be maintained, so as not to be too far ahead of the decisions by the commission. Under Mr. Spurr, J. A. Battle, Jr., has had charge of the engineers, and C. B. Holmes has been in direct charge of the accountants.

After a more careful consideration of the effect of the Attorney General's opinion, it is believed that slightly more than one-half of the claims filed with the War-Minerals Relief Commission will be eliminated. The Attorney General's opinion[1] was to the effect that claimants must show that an appeal was made to them by one of the five bodies mentioned in the statute. With the claims thus eliminated, there no longer is doubt that the $8,500,000 appropriated will be sufficient to settle all claims which fall within the statute.

Some claims are being eliminated by the discovery that the claimant may have profited in another operation. The commission declines to pay the loss on one property when others held by the same claimant have been profitable. In one case the claimant established without difficulty a loss of $2,700, but from another source the commission learned that the claimant had received profit of about $30,000 in a similar operation.

Economic Conditions in Norway

A feature of recent economic developments in Norway, writes Nels A. Bengtsen, trade commissioner for the Bureau of Foreign and Domestic Commerce, is the almost complete shutdown of ten of the largest carbide, aluminum, and cyanide plants in that country. These plants, when running at full capacity, employed more than 6,000 men, but during the last few months they have employed only about half that number. In the early part of August, it is reported, labor troubles developed, which seriously affected the output of the plants.

The mining industries at present are also in a stagnant condition, some of the largest pyrite and copper mines having reported that they can no longer produce in competition with other countries, on account of the difficulty of mining conditions. Many of the older mines report a scarcity of ore, and indicate that they will have to find virgin areas in order to produce according to the pre-war scale.

The electrochemical and electrometallurgical industries, it is said, are also passing through a depressing transition period, from war conditions to a peace basis. It is predicted that some plants will find it difficult to maintain operations when the keen demand and inflated prices prevalent during the war period give way to normal demands and open competition. This, it is thought, will be especially true for such plants as use relatively large quantities of raw materials in proportion to the values of finished products. Norway is, on the whole, it is reported, deficient in raw materials for these industries and has a limited market for their products.

Offsetting these disadvantages, Norway has cheap hydroelectric power available at factory and harbor sites. The well-developed shipping lines, added to the preceding factors, combine to favor the industry, it is said, in which electrical energy is a factor of maximum importance, and consequently are of advantage to those which use relatively small quantities of raw materials in proportion to the value of finished products. It is believed that developments along these lines will characterize future Norwegian industrial progress.

Mining Laws of Nova Scotia

A digest of the mining laws of Nova Scotia was recently received by the Bureau of Foreign and Domestic Commerce from the American Consul General at Halifax. The Minister of Public Works and Mines, he reports, states that no restrictions, either legislative or administrative, which are not placed on British subjects, are placed on aliens, in the granting of mining rights or concessions for the operating of mines, or the distribution of mineral products. There are not at present in the province of Nova Scotia, the consul says, any extensively large mining grants which because of their size cannot be developed by the concessionaires in the immediate future. All ores and minerals, however, are subject to royalties to the Crown.

The right to mine minerals or to prospect for minerals must be obtained from the Mining Department. Licenses are issued for gold and silver prospecting, and for all other minerals, exclusive of gold and silver. Applications for prospecting may be filed by anyone with the Mines Department. The license to prospect, when issued, is valid for eighteen months, and leases run for twenty years, at a yearly rental per area. Practically all leases, it is stated, are renewable for a further period of twenty years, and may be renewed as many as three times thus making the original lease and renewals operative through the period of eighty years.

[1] *Eng. and Min. Journ.*, July 19, 1919, p. 107.

American Electrochemical Society Meets at Chicago

Electrochemists Gather in Joint Sessions With Mining and Metallurgical Engineers—Important Present-Day Problems Discussed

CONCURRENTLY with the convention of the mining and metallurgical engineers at Chicago, as well as the Exposition of Chemical Industries and other events, the American Electrochemical Society held its thirty-sixth general meeting in that city on Sept. 23 to 26. Headquarters were maintained at the Congress Hotel. Registration of members and their guests began at the hotel early Monday morning, but was later continued at the society's booths on the balcony of the exposition at the Coliseum.

The program of the meeting really began on the following day. During the afternoon a joint technical session on "Iron and Steel" was held, the list of papers presented and discussed being given in the A. I. M. E. program. A further session on the same subject took place in the evening at the hotel.

"Ferrous and Non-Ferrous Metallurgy" was the general subject of the afternoon session on Sept. 24, F. A. J. Fitzgerald presenting a paper on the "Radiant Resistor Furnace," and A. M. Clark one on "Electric Heat in the Typewriter Industry." Other papers discussing the electric furnace were presented by Mr. Fitzgerald and H. G. Weidenthal.

In the evening electric-furnace exhibits in the exposition auditorium were inspected by the members, following which motion pictures showing electric furnaces in operation were displayed. The subjects included "Resistance Type Furnaces for Melting Non-Ferrous Metals"; Detroit Rocking Electric Melting Furnace in Operation"; and "Electric Furnaces in the Heat Treatment of Essential War Materials."

The joint session on "Pyrometry" occupied morning and afternoon sessions at the Congress Hotel on the third day. In the evening the members were entertained at a smoker as guests of the local committee.

"Catalysis" was the subject of the sympcsium in the forenoon of the last day. Prof. H. S. Taylor, of Princeton University, presided over this session. Those who took part included W. D. Bancroft, H. S. Taylor, and W. J. Huff. In the afternoon a demonstration of the manufacture of fluorine was given by Prof. F. C. Mathers and Burr Humiston, and various technical papers were presented. The evening was spent in visiting the exposition.

Safety Congress Convenes

Eighth Annual Meeting of National Safety Council To Be Held in Cleveland Oct. 1 to 4—Many Interesting Papers and Exhibits Planned

THE Eighth Annual Safety Congress, under the direction of the National Safety Council, will be held at the Hotel Statler, Cleveland, during the four days beginning Wednesday, Oct. 1. The sessions on the first day will be general in character, the last three days being devoted to special meetings of particular interest to various groups, including the automotive, cement, chemical, construction, electric railway, metals, mining, packing, paper and pulp, steam railroad, textile, wood-working, rubber, and marine industries.

The week of Sept. 28 to Oct. 4 will be observed in Cleveland as "Safety Week," and a special effort will be made to avoid all industrial accidents. During Safety Week in St. Louis, where the annual meeting was held last year, the only death from accident was that of an intoxicated man falling from a wagon, and with the laws now in force it is hoped that Cleveland will, during this week, set a new record in community safety.

In addition to the meetings on Wednesday in which all will be interested, the following papers which will be of special interest to the mining profession, will be read, each to be followed by discussion.

Thursday morning, Oct. 2, Room 341.

9.30—"Mine Accidents, English Speaking vs. non-English Speaking Employees." By A. H. Fay, mining engineer, U. S. Bureau of Mines.

10.15—"Training and Handling of Men." By M. W. Gidley, safety inspector, Copper Queen Co.

11.00—"Labor Turnover and Its Relation to Mine Accidents." By E. E. Bach, chief Americanization Bureau, State of Pennsylvania.

11.30—"Industrial Relations in the Mining Industry." By Charles F. Willis, of the Phelps Dodge Corporation.

Friday morning, Oct. 3, Room 341.

9.30—"Fire Prevention in Anthracite Coal Mines and Necessary Equipment for Fighting Mine Fires." By M. W. Price, efficiency engineer, G. B. Markle Co.

10.15—"Effective Use of Rescue Apparatus in the Fighting of Mine Fires." By T. Ryan, Mine Safety Appliance Co.

11.00—"The Desirability of Standardizing Mine Rescue Training and a Plan for Standardization." By D. J. Parker, mine safety engineer, U. S. Bureau of Mines.

Saturday morning, Oct. 4, Room 341.

9.30—"A Compilation of Chute Types for Loading Ore Into Tram Cars in Metal Mines." By C. A. Mitke, mining engineer, Phelps Dodge Corporation.

10.15—"The Importance of Safety Measures to the Miner." By Major Arthur S. Dwight, chairman, Industrial Organization Committee, A. I. M. E.

11.00—"Need for a Definite Technical Service in the Mining Section of the National Safety Council." By B. F. Tillson, assistant superintendent, New Jersey Zinc Co.

Many mine safety engineers will also be interested in an Employees' Publications Luncheon Round-Table to be held on Thursday, Oct. 2, at 12.30 p.m., at which such topics as the following will be discussed: How to interest the management to appropriate funds for a plant organ. What benefits should a corporation expect to derive from an employees' publication? What can employees' publications do to promote industrial good-will? What kind of material is needed to make the plant periodical a success? How to obtain news items for a plant publication.

On Thursday afternoon a general session will be held on Americanization and the immigrant problem; on Friday noon a luncheon round-table to discuss the safety bulletins and posters; on Friday afternoon a general session on health; and on Saturday afternoon, a general session on safety education.

The entertainment of those attending the Congress has also been given considerable attention. There will be a reception and informal dance in the Statler ball-

room on Wednesday evening; an informal dinner and smoker at the Hotel Winton on Thursday evening, and the annual banquet (informal) on Friday.

One of the principal features of the congress will be the Safety Exhibit which will occupy 14,000 sq.ft. of floor space in Grays' Armory. This will be the most pretentious and elaborate exhibition of its kind ever made, practically all of the leading manufacturers of safety devices being represented. Those who attend this exhibit will learn of all the latest and best ideas in guards, sanitation, and lighting, many features of a practical nature having been recently developed.

International Exposition of Mining Industries

The opening date of the International Exposition of Mining Industries at New York has been changed from Oct. 15 to Dec. 1, owing to the delay of the Government in vacating Grand Central Palace. This decision was made when it was found that the time was not sufficient to prepare the building and exhibits.

The International Exhibition of Mining Industries, as mentioned in the *Journal* of Aug. 2, forms a part of the project that contemplates a permanent exposition of various industries, the scheme being fathered by the Nemours Trading Corporation, of which Alfred I. Du Pont is president. Howard R. Ward, who is manager of the mining industries section, recently returned from an extended trip through the West, and reports that there is widespread interest on the part of manufacturers and engineers in regard to the exhibit. Comprising the advisory committee are the following: H. C. Parmelee, H. R. Ward, S. A. Taylor, Frederick G. Clapp, Ralph Arnold, Kenneth Seaver, H. H. Stoek, and Charles W. Merrill.

Petroleum in Cartagena District, Colombia

The American Consul at Cartagena, Colombia, in a report recently received by the Bureau of Foreign and Domestic Commerce, declares there is a lack of activity in the development of the oil fields in that consular district.

So far as is known, he reports, only two American companies have acquired concessions to explore and exploit lands for petroleum in the Cartagena district. Nothing but preliminary explorations have been made by these companies, although other American companies are making investigations in the same department.

It is understood that three groups of British geologists, representing British capital, are making investigations in the same region, a former member of the U. S. Geological Survey being one of the number.

At present, the American consul reports, exploitation of petroleum wells is at a standstill, awaiting the result of the suspension of the recent decree regarding subsoil rights.

Michigan Copper Output in August

The production of ingot copper from the mines of the Michigan district for the month of August was 13,302,886 lb., a decided increase over the output for July but only 70 per cent of normal production. The outstanding features were the increase in the production of the Calumet & Hecla of nearly a million pounds, the decided increase in the Ahmeek and Osceola mines, and the exceptionally high-grade yield shown in the Champion mine of the Copper Range, as well as the increase in copper total. La Salle drops out entirely and Superior's output is practically nothing. Winona entered the list of producers for August, but had not operated long enough to get any mineral to the smelter.

The following is a carefully prepared tabulated statement giving the approximate results in actual copper produced at all of the mines in the Michigan copper district. In some of the mines the figures are official smelters' and mine records; in others they are estimates; but the approximations are conservative in each instance.

COPPER OUTPUT OF MICHIGAN MINES IN AUGUST

Mine	Rock Tonnage	Lb. per Ton Aug.	Lb. per Ton July	Refined, August	Refined, July
Ahmeek	55,890	22.2	20.8	1,245,300	958,500
Allouez	13,600	18	14.5	245,800	150,100
Baltic	20,000	34	35	680,000	654,500
Calumet & Hecla	165,472	25	22.4	4,136,818	3,292,821
Centennial	5,075	13.9	15	70,500	76,002
Champion	45,000	40	35	1,800,000	1,330,000
Isle Royale	58,865	18	18	1,059,583	935,150
Mass Consolidated	7,143	14	14	100,000	92,321
Michigan	5,000	32.2	....	161,254	184,175
Mohawk	43,157	21.36	23.4	922,209	1,012,575
Osceola Cons	56,700	14.4	13	817,600	651,000
Quincy	90,000	18	18	1,620,000	1,500,000
Superior	650	17	20	11,000	35,025
Victoria	10,000	12.5	16.5	130,000	108,900
Wolverine	27,493	14.65	13.8	402,822	331,736

Davis-Daly Copper Co.

The report of the Davis-Daly Copper Co. for the quarter ended June 30, 1919, states that much underground development was performed during the period reviewed, and some excellent orebodies were opened, which added materially to the ore reserves.

The Belmont crosscut, which was started in December, 1917, for the purpose of ventilating the mine, has been completed, and has accomplished the cooling of the underground workings materially. The temperature has been reduced from 110 degrees to 85 degrees, permitting full eight-hour shifts, and increasing the efficiency of the men. Surface improvements are under way, and the new skip and steel ore bins will be installed soon, thus facilitating hoisting and increased production. The wage question is approaching settlement, and there is little or no difficulty in securing good and efficient men.

On June 22, shaft sinking at the Colorado mine was begun from the 2,500-ft. level to the 2,700-ft. level. It is planned to connect by crosscut with the downward extenson of the orebody found on the 2,500-, 2,300-, and 2,100-ft. levels. Total development for the quarter was 1,938 ft., comprising 801 ft. of drifts, 263 ft. of crosscuts and 874 ft. of raises.

Shipments for the quarter amounted to 10,700 tons, producing 1,859,747 lb. of copper and 72,784 oz. of silver. The average assay of the ore shipped for the period was 8.98 per cent copper.

Total receipts for the quarter amounted to $257,736.11, and total disbursements were $185,735.24. The disbursements included $81,869.71 for development, $72,758.94 for mining cost, and $14,950.26 for equipment.

Iron Bacteria are actively engaged in the deposition of compounds of iron not only in surface iron-bearing waters but in mine waters to depths of several hundred feet. A special paper on the subject, "Iron Depositing Bacteria and Their Geologic Relations," has recently been issued by the U. S. Geological Survey. E. C. Harder, of the Survey, who has examined deposits of iron ore in many countries for the special purpose of determining their mode of origin, has recently made close studies of the action of bacteria in forming iron ores, and has made laboratory cultures of various iron-depositing bacteria.

BY THE WAY

Naturally

"Naturalization of Mines Now Being Proposed by Miners" runs a headline in a paper of the Middle West. It is perfectly logical, of course, that this should precede any attempt to Americanize the miners.

Bacteria and the Steel Strike

At a time when the down-trodden steel workers are striking it is interesting to read of the industry of the iron-depositing bacteria and their geologic relations. Among them everybody works, including father, as E. C. Harder shows in his paper on this subject just issued by the U. S. Geological Survey. Mr. Harder gives the results of his laboratory experiments in bacterial iron deposition, considers the probable extent of influence of bacterial action in forming deposits of iron ore, and gives a bibliography containing titles of the papers on work of bacteria in rock and ore deposition. All this reminds us of the saying "from shirt sleeves to shirt sleeves in three generations." What the lowly bacteria has perhaps painfully accumulated, the profligate steel worker squanders, directly or indirectly as you choose, and then impudently asks for more. Go to the iron-depositing bacteria, thou steel worker, learn of their ways, and be wise.

An Impending Calamity

A cloud no bigger than a man's hand has arisen above our horizon, and the barometer is rapidly falling. The wind is rising, and the birds have hushed their voices. Obviously a storm threatens. It does, indeed! Woolsey McAlpine Johnson, of the Potash Patents Corporation, objects to our calling his advertising "bunk." The criticism to which he takes exception appeared in the issue of July 26 under the caption "Potash and Wooden Nutmegs." But the half was never told—lack of space prevented. Many a gem was perforce omitted. For instance, the funds that Mr. Johnson would raise by the bond issue advertised are to be used, among other purposes, to enable him to develop his "Bacchus Barlicawn Bar-none Raspberry Juice," though what this has to do with potash products it is hard to see. Mr. Johnson, however, is to be given credit for having rung all the bells at once. He appeals in one ad. to nearly every trait that ever makes a "sucker" part with his cash. But the postoffice inspectors may get him if he doesn't watch out. What more horrible fate than to fall into Mr. Burleson's hands!

Other Peoples' Worries

The importance of engaging in welfare work, or "industrial relationship work," as one large mining corporation prefers to call it, is now well recognized by mining companies, and thereby a new qualification is added to those that the ideal manager must possess. But the same ideal manager, if by any chance he exists, may be glad if his lot is cast without the Dark Continent. As one reads the account of Dr. Orenstein's testimony before a government commission in South Africa, dealing with the methods of combating pneumonia among the natives, he can almost picture the executive on the Rand as playing nurse to a lot of black boys. The recipe given for caring properly for the tropical native is that he should be housed in the cubicle type of compound room, given his government ration without stint, plenty of good blankets for his bed and one to put on coming up from the mine, a hot ration before going down, a dry ration at half-shift, and main ration as soon as possible after quitting work. For the rest, he is to be protected from cranks, both medical and lay.

The Clarity of Language

"Every naow an' again, m'son," said Cap'n Dick, "some chap starts h'agitatin' for this 'ere h'Esperanto or universal language. Tha h'only trouble is, m'son, that there is so much h'agitatin' these days that h'unless man belongs to some union of h'other 'e's liable not to be 'eard. But that's neither 'ere or there. Tha point to be h'understood is that there should be some way by means o' w'ich a man could make 'is meanin' clear to tha chap 'oo 'e's talkin' to. There's too much confusion an' babel baout some things that could be made simple if people h'only 'ad proper understandin' an' a fair means o' talkin' to h'each h'other. I am reminded, m'son, o' tha time Tom Trewella bloody near come to blaws with 'is butcher for lack o' h'understandin' h'each h'other. Tom gaws daown taown one moornin' to buy a bit o' steak for 'is missus. In 'e gaws to tha butcher shop, an' firs' thing e' sees, standin' h'up on top o' tha counter, is a stuffed bird, tha like o' w'ich e'd never seen. 'Ere, Billy,' sez 'e to the butcher, 'W'ot's thee want for tha broad-faced chick?' 'Tha's no broad-faced chick you, 'e's a h'owl,' sez tha butcher. 'Gos' along,' h'answered Tommy. 'W'y, dam-me, 'e's never too h'old for boilin.' W'ot's tha matter with thee?' "

D. E. A. C.

In Telluride

Rare is the mining camp that does not boast the good old days when it was young and history was lurid in the making. But Deadwood, Cripple Creek and Leadville, Butte, Virginia City and Globe have gone and got religion—or else the movie habit. The heroes of other days now stalk boldly across the screen instead of through the city streets, and in the audience that beholds them the tenderfoot is not to be distinguished from his neighbors.

It is in Telluride that one catches occasionally a glimpse of other days. Some say that no one ever dies a natural death in Telluride. What a twist in the scheme of things that this place, set in its wonderful mountain scenery, should have been and should still so often be the scene of unfortunate events. Man has rivaled nature in taking life. The history of the camp is replete with accounts of robberies, murders, death by snowslides and other causes, and many mysteries are still unsolved. The latest crime occurred on Sept. 10, when four contractors were shot to death on the upper level of the Tomboy company's Montana mine just as the shifts were changing. The gunmen, who were masked, made their escape, and no motive for the crime has been deduced. Level No. 1 of the Montana mine is up in the Middle Basin, within a thousand feet of the top of the range and several miles from the outside workings of any other property worked by the Tomboy company. The writer of fiction who is tired of war subjects may find what he is looking for in Telluride.

PERSONALS

J. B. UMPLEBY, who has been a member of the staff of the U. S. Geological Survey for many years, has resigned to become the director of the school of geological engineering at Norman, Okla. One-half of his services is to be devoted to the school and the remainder to work as a consulting geologist.

Clarke Sullivan, of San Francisco, is in Ely, Nev., on professional work.

F. G. Stevens, of Toronto, has returned from examining mines in Central America.

G. L. Sheldon, formerly of Ely, Nev., recently visited Chaffee County, Col., on examination work.

C. Schuette, formerly on the staff of the Bureau of Mines, has left San Francisco for Nevada.

R. A. Bryce, of Toronto, is opening up a gold property in the Cariboo District, British Columbia.

William F. Ward is engineer for an hydroelectric power project in the district of Ocana, Colombia, South America.

D. L. Cleaves, of St. Louis, has accepted an appointment with the Balbach Smelting & Refining Co. of Newark, N. J.

Major L. A. Barton has returned from overseas service and will resume his practice as soon as he receives his discharge.

Harvey B. Small, manager of the Liberated mine, in the district of Guamoco, Colombia, South America, is in New York.

G. C. Bateman, of Cobalt, has returned from Port Arthur, where he has been examining some of the old silver mines in that district.

J. R. Stroh, assistant manager mining department Brier Hill Steel Co., has been named manager, succeeding **John N. Allen,** resigned.

Benedict Crowell, Assistant Secretary of War, has returned from France, where he had been for six weeks attending to the settlement of Army affairs.

Oscar H. Reinholt, recently returned to San Diego from a professional trip to Sierro County, Cal., and expects to proceed soon to San Angelo, Texas.

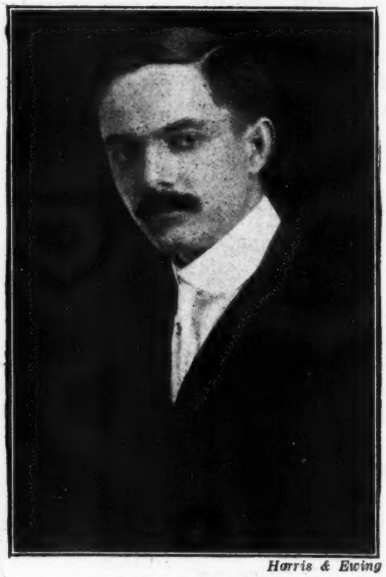
James L. Bruce, manager of Butte & Superior Mining Co., has resigned to become manager of the Davis-Daly Copper Co. He will take up his new duties on Jan. 1, 1920.

Karl C. Parrish, who has been engaged in mining in Colombia for several years, is at present engaged in engineering and developing an addition to the City of Barranquilla.

J. J. Becker, formerly manager of the blast furnace of E. J. Lavino & Co., at Lynchburg, Va., will become manager of a furnace operated by associated interests at Sheridan, Pa. His successor at the Lynchburg plant will be **M. D. Langhorne.**

M. Y. Williams, of the Canadian Geological Survey, who is an authority on the geology of oil areas, and **Joseph Keele,** of the Mines Branch, a specialist in clays, are making examinations along the proposed T. & N. O. railway extension north of Cochrane.

Dr. Charles L. Parsons has resigned his position as Chief Mineral Technologist of the Bureau of Mines to take effect Nov. 1. He expects to open offices in Washington on that date, and in addition to conducting the Washington office of the American Chemical Society, will engage in private work.



Harris & Ewing

J. B. UMPLEBY

OBITUARY

Angus McDonald, one of the pioneers of the Cobalt district and afterwards engaged in mining in Nevada and Colorado, was accidentally shot recently while on a hunting expedition. Mr. McDonald was thirty-three years old.

Nathaniel Stone Simpkins, prominent in the development of the Calumet & Hecla and other copper mines, died recently in Connecticut. Mr. Simpkins is survived by his wife, three sons, and one daughter. He was graduated from Columbia University, New York, with the class of 1882.

John Daggett, former superintendent of the San Francisco Mint and Lieutenant-Governor of California, died on Aug. 30 at Black Bear, Siskiyou County, Cal. Mr. Daggett went to California from New York in 1852 and was among the well-known early Californians. Early in 1853 he entered California state politics and was nominated for Lieutenant-Governor at the Democratic convention in 1882. In 1893 he was appointed superintendent of the San Francisco Mint. After his retirement from the Mint, Mr. Daggett returned to his mine at Black Bear, Siskiyou County. He led a secluded life up to his death.

SOCIETIES

American Society of Mechanical Engineers held a meeting in New York on Sept. 17. Dr. William M. Leiserson, of the U. S. Department of Labor, spoke on "Industrial Unrest."

Mining and Metallurgical Society of America. The New York Section held a meeting at the Columbia University Club, New York, on Sept. 23, W. R. Ingalls presiding. The subject "Occupational Training" was discussed by Prof. Robert Peele and other speakers.

INDUSTRIAL NEWS

Pacific Tank & Pipe Co. is to offer $750,000 ten-year first mortgage bonds, the amount realized to be applied as working capital. The increase in the company's business has rendered this step necessary.

Charles Hardy, metal and ore broker of New York, has acquired a warehouse at Hoboken, N. J., which he states combines unusually good structural features and handling facilities. The building will be devoted entirely to the storage, inspection and sampling of metals, including iron and steel, tin plates, and minerals.

The Western Electric Co. recently added a lighting department to its general sales organization for the purpose of fostering the propaganda for better lighting in factories, offices, hotels, clubs, and residences. E. Cantelo White, who has had almost fifteen years' experience in the electric-lighting field, will be in charge.

Traylor Engineering and Manufacing Co. announces that it has booked the following recent orders for mining and crushing machinery: New Jersey Zinc Co., two sets 30 x 16-in. Traylor rolls, with automatic lateral adjustment; Thomas L. Barrell, Louisville, Ky., one No. 3 gyratory and one 30 x 12 ft. trommel screen; Great Western Portland Cement Co., one 48 x 60-in. "Bulldog" jaw crusher; Choctaw Portland Cement Co., one 42 x 48-in. "Bulldog" jaw crusher; W. R. Grace & Co., four 36 ft. by 72 in. revolving trommel screens; Sociedad Minera y Metalurgica de Pennaroya, one 3 x 6 ft. Sheridan shaking grizzly; Amparo Mining Co., one 5 x 20-ft. tube mill; Chicago Gravel Co., one 4 x 12-ft. "Bulldog" grizzly feeder and one 8-in. "Bulldog" gyratory crusher.

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief of Interest to Engineers and Operators

SAN FRANCISCO, CAL.—Sept. 17

John D. Hoff has begun suit through his attorneys, Clarke and Clarke, for infringement of his patent for calcining magnesite ore. The defendants are the Magnesite Production Corporation and Moore, Morrison, et al., owners of the Sampson magnesite properties in San Benito County, Cal. The patent is said to consist in a new and improved method of calcining magnesite ore in vertical kilns, by which the by-path process insures a continuous operation of the kiln and a more perfect calcination of the ore for plastic purposes. Mr. Hoff and associates have also begun action to recover the property, which they have under lease and on which they claim to have expended within the last two years more than $100,000. Operations have been suspended for several months because of the tariff situation and the scarcity of market demands.

RENO, NEV.—Sept. 17

The Silver Peak Chemical Co. is mining what is said to be the only known deposit of water-soluble potash alum in commercial quantity, seven miles southeast of Blair Junction, on the T. & G. R.R., in Esmeralda County, Nev. According to W. B. Roberts, manager of the company, tests made by E. E. Free, of the U. S. Geological Survey, and others, show that the ore now opened up will average 20 per cent pure potash alum. The deposit has been developed by eight shafts, with numerous drifts and crosscuts, for a length of 1,000 ft., depth of 75 ft., and width of 70 ft. The process of extraction will be simple, according to chemists who have made numerous analyses and crystallization tests. The company announces that it has ordered a 100-ton plant and expects to have it in operation within ninety days.

A Vote To Call Off the Strike at Tonopah and Divide, taken recently at a meeting of conservative miners of the district, resulted in 279 votes in favor of the motion and 51 against. Governor Boyle and operators expected, therefore, that work would be resumed Sept. 15. At a meeting of the more radical held afterward, a motion was likewise made to call off the strike. An amendment was also offered that Tonopah be declared a scab town, but the meeting adjourned without action on the motion or the amendment. Speakers at this meeting declared the strike had only just begun. The expected resumption did not take place, therefore, on Sept. 15, and the future is uncertain. There were 1,500 miners and mill men in the district before the strike, and it is estimated that of these 500 have already departed.

SPOKANE, WASH.—Sept. 17

Northwest Mining Association, at its meeting held in Spokane on Sept. 12, indorsed the Jones-Reavis bill, now before Congress, providing for the creation of a Department of Public Works, with an engineer at its head, who shall be a member of the President's Cabinet. The association in its resolution urged that Congressmen from the Northwest support the bill. A copy of the resolution was sent to each Senator and Representative in Washington.

WALLACE, IDAHO—Sept. 16

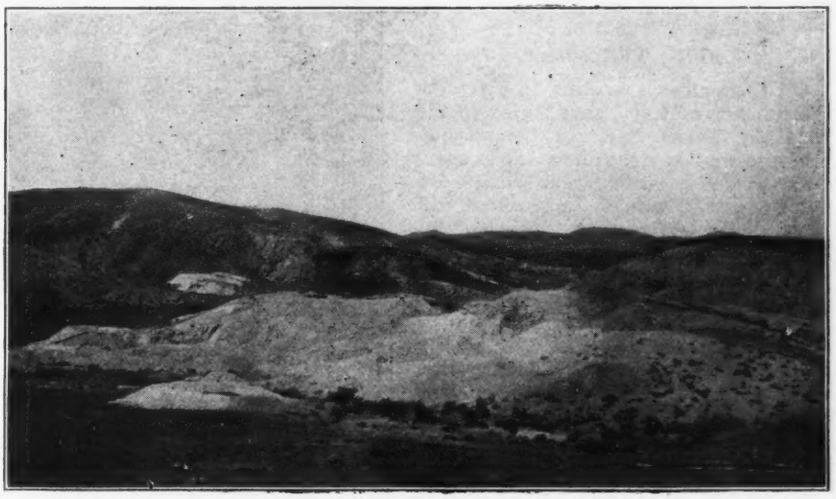
The Strike at the Coeur d'Alene mines has been without disorder thus far. Picketing at the Hecla mine became rather offensive at the start, but a warning from the sheriff's office had immediate effect. The force at the Hecla has increased, now totaling about seventy-five men, who are engaged in repairs on pumps and in similar work. No men are employed at any of the other mines except watchmen and those necessary to keep pumps running. There is a fixed determination on the part of the companies to give no recognition to the union. The impression prevails in the district that the Hercules and Tamarack mines, controlled by the Days, will not attempt to resume operations until spring. The Northport smeltery, which handles the ores from these mines and is also controlled by the Days, is closed down.

BUTTE, MONT.—Sept. 19

First Break in Metal Crafts Strike in Butte district took place Sept. 18, when the machinists at the Anaconda smeltery at Great Falls, Mont., voted to return to work, accepting the old offer of the company. The Metal Crafts is an independent union consisting of machinists, engineers, and electrical workers. The men in the organization refused to accept the wage offer made by the Butte mining companies at the time of the strike in February of this year. Metal Crafts consist of only 6½ per cent of the total mining labor of the district.

HOUGHTON, MICH.—Sept. 17

Calumet & Hecla's longest underground level will be completed Jan. 1, notwithstanding the fact that operations at the south end are suspended. The drifting to the north continues at full speed. This underground project will be 8,000 ft. long when completed and will connect lower levels of the Red Jacket perpendicular shaft with the lower levels of the conglomerate angle shafts and ultimately will provide a tramway for the lowest level. When this work is completed five shafts of the South Hecla, Nos. 6, 7, 8, 9, and 10, will be operated through subshafts and the rock trammed over to the Red Jacket shaft. Once this work is well under way all pillars can be removed from the South Hecla shafts from a point 8,000 ft. from surface, and the shafts permitted to cave. New miners are being added to the crew of the Calumet & Hecla and subsidiaries at the rate of fifty a day.



DEPOSIT OF POTASH ALUM NEAR BLAIR JUNCTION, ESMERALDA COUNTY, NEV., BEING WORKED BY SILVER PEAK CHEMICAL CO.

Mohawk Mining Co., in the Michigan copper country, is concluding an interesting construction job at the stamp mill at Gay. The drift out under the waters of Lake Superior, through the sandstone, has now attained a lateral distance of 2,100 ft. and has 700 ft. more to go before the raise is cut through to let the water in. When completed, this system will bring water from a point 2,800 ft. out in the lake and 28 ft. under the surface for use in the mill. Long experiments have proved that the spot selected for this intake is practically clear of stamp sand and float ice, owing to the prevailing wind and the topography of the lake. The shaft was sunk 125 ft. from the pump house, and 110 ft. below the level of the lake. At 90 ft. depth below the lake level a pump station was cut. The tunnel work has been under way since last winter. Two weeks ago a cylinder was sunk, with the aid of divers, in the lake bottom, at the point where the upraise is due to hole through. From this cylinder a steel rod has been sunk to the point where it will connect with the tunnel, and the raise will follow the line thus given. The present intake for water used at the mill is near the mouth of the Tobacco River. The work of the pumps has been seriously hampered every winter by floating chunks of ice and by foreign matter that washes up close to the shore.

AUSTIN, TEX.—Sept. 16

Oil Companies operating in Texas to the number of 1,400 have failed to file with the Texas Railroad Commission the information regarding their operations required by recent act. Another call will be made, and action will probably be taken gainst those not replying.

Suit for Oil Land valued at $8,000,000 has been entered in the district court of Travis County by the State of Texas. The land in question is 160 acres in Stephens County, and the defendants are Gulf Production Co.; Shamrock Oil Co., of Waxahachie; John F. Lewis, of Dublin; C. M. Caldwell and wife, and B. S. Walker, of Stephens County; N. N. Rosenquest, of Taylor County; and J. L. Mayfield, of Wichita County. Title is in question because the original owner forfeited his rights, and was later reinstated under conditions claimed by the state to be illegal. Defendants are claiming title under original purchase. In addition to the land, the state is suing for $300,000 damages for oil and gas removed.

Sinclair Oil Corporation will build a model industrial city to accommodate 6,000 population at its projected $1,000,000 refinery. The site includes 700 acres, fronting on the Houston ship channel. The first unit of the town will consist of fifty bungalows, with others to be built as needed. In addition to the dwelling houses, there will be built a community settlement house, hospital, schools, library, stores, swimming pool, and other community buildings. The hospital will be planned after that at Gary, Ind.; the schools will give trade and domestic science courses, in addition to the usual studies; the stores will be municipally managed. The larger buildings will be of fireproof construction. C. K. Birdwell, of Houston, is architect, and W. W. Mellin is resident engineer.

BIRMINGHAM, ALA.—Sept. 12

The Sloss-Sheffield Steel & Iron Co. is again in the market with some offerings of iron, and with further business in sight its prospects are bright for the coming quarter. This company is planning to build fifteen or twenty new cottages at its mines as well as a new church for negroes. It is said that more men are employed now at the company's mines than ever before.

Business in the Birmingham iron industry is becoming better as the last quarter draws near. No orders have been accepted for 1920 delivery so far, though it is known that consumers are urging the acceptance of orders totaling close to 100,000 tons.

Much concern is noticeable in the iron and steel circles of the district over the expected strike of iron and steel workers set for the last part of this month. Just what is the strength of the unions in the Birmingham district is not known, but it is said in some quarters that about 40 per cent of the district is organized. The strike, should it last for any length of time, will seriously affect all industries. It is particularly to be regretted at this time, when so many concerns are just beginning to rally from the setback of the first half of the year. Some of the companies are planning to push construction work in case all other operations are stopped.

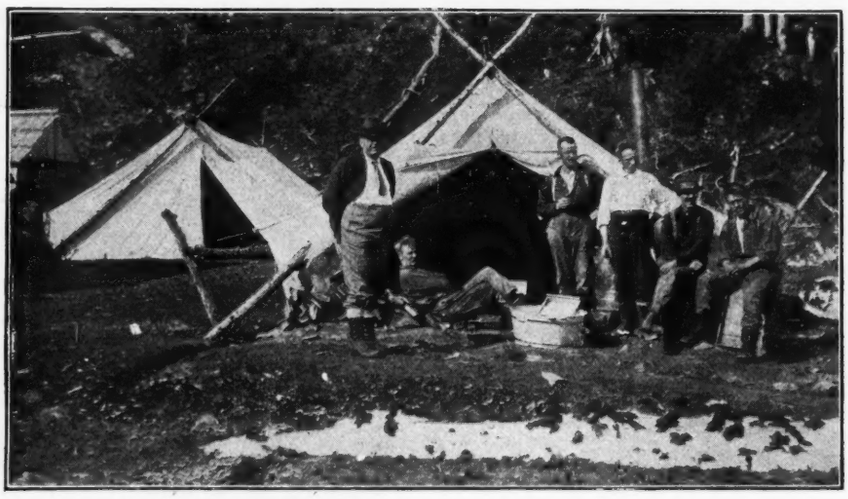
An electric haulage system costing $100,000 was completed about Sept. 1 at the Virginia mines. The work was begun Mar. 1. This will effect a lowering of tramming costs.

NEW YORK, N. Y.—Sept. 18

Adolph Lewisohn & Sons, Inc., was chartered at Albany, N. Y., with $6,000,000 capitalization and Adolph and Samuel Lewisohn directors. The company is authorized to conduct a general real-estate business and engage in mining and refining of metals.

BOSTON, MASS.—Sept. 17

Balaklala Consolidated Copper Co.'s lawsuit against the United States Smelting Co. for recovering approximately $34,000 claimed to be due in settlement for copper has been shifted from the California state court to the Federal court. The litigation resulted largely from the cessation of quotations published by the *Engineering & Mining Journal* closely following the armistice last November. A smelting contract between the two companies was based on these quotations. One difference between the contestants has to do with whether the next published quotation of the *Journal* constituted the basis for settlement of whether a market for the metal existed in the period between the dates of published quotations.



AT CAMP OF BIG MISSOURI GROUP, SALMON RIVER DISTRICT, BRITISH COLUMBIA. WILLIAM SLOAN, PROVINCIAL MINISTER OF MINES, IN FOREGROUND. SNOW IS ON THE GROUND, THOUGH PICTURE WAS TAKEN IN MID-SUMMER

Louis Ross is entitled to recover only $100,000 from Albert C. Burrage, instead of a percentage of profits, which Ross alleged to be about $25,000,000, made by Burrage in the sale of mining properties in Chile to the Guggenheim interests, of New York. This is the decision given by the Supreme Court in Boston on Sept. 10. The court ruled that Ross was bound by the agreement made with Burrage in 1912, under which Burrage had the option of paying Ross $100,000 or transferring to him 5 per cent of the securities coming to Burrage as profit from the exchange of the options on the mining properties brought to his attention by Ross. Burrage elected to make the cash payment. The court declared the plaintiff entitled to a decree directing the defendant to pay the $100,000 forthwith.

THE MINING NEWS

**Progress of Mining Operations
Condensed and Classified
for Easy Reference**

ALASKA

August Shipments of domestic copper matte, etc., from Alaska to United States totaled 7,816 gross tons; copper contents, 4,333,009 lb., valued at $793,650.

Kennecott (Kennecott)—August production of copper, 8,224,000 lb., including output of Braden Copper Co., against 5,873,560 lb. in July. Increase 40 per cent, due to improved market.

Salt Chuck (Ketchikan)—Recent car shipment returned 36.96 per cent copper, 6.1 oz. silver, 1.27 oz. gold, 0.10 oz. platinum, and 2.93 oz. palladium. Andrew G. Larson, of Spokane, engineer in charge, says some shipments are higher and some lower in value than this. Property on Prince of Wales Island.

ARIZONA

Cochise County

Shattuck Arizona (Bisbee)—Produced in August 386,027 lb. copper, 708,526 lb. lead, 33,383 oz. silver, and 51 oz. gold. This came from ore taken out in development work in June, July and August, which was smelted in August.

Phelps Dodge (Douglas) — Smeltery copper production for August was as follows: Copper Queen branch, 5,264,000 lb.; Moctezuma Copper Co., 3,422,000; Burro Mountain branch, 234,000; custom ore, 337,000; total Douglas smeltery, 9,257,000; Detroit branch (Morenci), 1,315,731; total, 10,572,731.

Gila County

Arizona Commercial (Globe)—August production about 600,000 lb. copper from 6,000 tons ore. Average copper content of ore produced in first eight months of 1919 was 5.66 per cent. New No. 2 shaft expected to reach 12th level early in 1920. Large tonnage commercial ore cut in two crosscuts on 10th level; also in 7th level crosscut.

Old Dominion (Globe)—Good ore showing continues in virgin ground on 16th and 18th levels east. Production at 60 per cent capacity.

Greenlee County

Arizona Copper (Clifton)—August production of copper, 2,900,000 lb.

Pinal County

Grand Pacific (Superior)—Over 300 ft. of development done in August. Extracting ore from two intermediate levels. Ore in upper levels running high in copper.

CALIFORNIA

Calaveras County

Carson Hill Gold (Carson Hill)—Milled 2,500 tons first ten days of September, averaging $17 per ton. Pushing development work on 875 level, where good ore was opened. Will make further payment on American Zinc Co. loan on Sept. 20.

El Dorado County

Lyman (Placerville)—L. A. Bender developing property. Shaft down 50 ft.; cutting tunnel at 40-ft. depth, providing ventilation.

Ohio (Placerville)—Under development since July 23 by W. G. Rossi and Boro Soderhjelm, of Placerville. Barrel gravel mill, bins, and gas engine installed. Drift run to connect with tunnel in adjoining mine for ventilation. Blocking out breast of average gravel. Will start mill soon.

Ralston (Placerville) — High-grade cemented gravel reported found in old Ralston deep-gravel gold mine twenty miles northeast of Placerville. Property worked by W. H. Duffy, with small crew; formerly owned by William C. Ralston.

Rising Hope (Placerville)—Blocking out good tonnage of hard cemented gravel with view to installing ten-stamp quartz mill. Gravel too hard for present barrel gravel mill. George W. Engelhardt, general manager; Charles M. Henson, superintendent.

COLORADO

Clear Creek County

Big Five (Idaho Springs)—Block of ground on Edgar vein 800 ft. from Central tunnel leased to Carl Gunnison, W. Thompson, and Emmet Tuck, who are raising to known orebody above. Freeman lease showing up well in heading being driven east from tunnel.

Community Sampler (Idaho Springs)—Has erected new 35-ft. mixing floor and expects to build ore bins on ground west of sampler recently bought from L. A. Hafer.

Golden Edge (Idaho Springs)—Under lease to A. Weinberger, who has small force cleaning up preparatory to starting development.

Lamartine (Idaho Springs)—Operated by C. H. Speiser, who is concentrating ore at Oneida mill.

Lake County

In St. Kelvin District a leasing company has secured control of the Griffen property. The Colorado Power company is extending its line to the portal of the old Griffen tunnel. This tunnel is over 1,000 ft. long, with a good showing of low-grade gold ore. Further development work will be done on the vein when new surface plant and equipment are installed.

SMUGGLER UNION MINING CO.'S MILLS, TELLURIDE, COL., LOOKING NORTH UP MARSHALL CREEK

Montrose County

Cashin (Paradox)—Preparing for production. Erecting buildings and adding to equipment. Contract let for 100-ft. shaft. Property has good body of high-grade copper and silver.

Radium Ore Sampler (Montrose)—

Has installed motor-truck system and is hauling ore by night.

Pueblo County

Colorado Thrift Oil & Gas (Fountain)—Has purchased heavy drilling machinery for drilling well near Fountain.

San Miguel County

Shipments from Telluride district in August were: Tomboy, 51 cars of concentrates; Smuggler, Humboldt, and Black Bear, 46; and Cimarron, 3.

IDAHO

Shoshone County

Amazon-Dixie (Wallace)—Mine recently examined by A. W. Ellenberger, capitalist, of Cleveland, who, with other Cleveland associates, has financed company. Will provide $150,000 and more, if necessary, to install electric power and electric hoist, and to sink 400 ft. from present 1,100 level, making total depth from surface 1,500 ft., or 800 ft. below main working tunnel, from which shaft is sunk. Ore on 1,100 level improved as compared with showing above. Mine situated in Montana near Idaho line at Sildix Station, on Northern Pacific.

Bullion (Wallace)—Diamond drill cut 14 ft. copper ore, carrying gold and silver. Same shoot located in upper tunnel and in shaft 400 ft. above. Strike taken to prove large body commercial ore. Mine on St. Joe side of divide, six miles from C. M. & St. P. road. Old grade of logging railroad, within three miles, which may be utilized.

Success (Wallace)—Working two sets of lessees, shipping lead-silver ore only. Operations otherwise discontinued, on account of strike.

MICHIGAN

Copper District

Lake Superior Copper again going out by rail in small lots to domestic manufacturers.

Quincy (Hancock) — Remodeling of smeltery on Portage Lake begun; will take five months. Enlarging main furnace building, in which will be installed two furnaces of capacity of 100-tons fine copper per day. Will equip plant with gasoline locomotives, new boiler plant with economizers, and new cranes. Plant handles custom ore as well as Quincy ore. Preparing to ship by rail lot of 750,000 lb. sold within fortnight.

Osceola Con (Houghton) — North Kearsarge has two laterals toward Ahmeek boundary in better copper than previously opened in this low-grade property.

Victoria (Houghton)—Adding to force and planning to put mine on two shifts.

Winona (Houghton)—Working Nos. 1 and 4 shafts. Underground force, 100. More men needed.

Mohawk (Mohawk)—Has full crew below and on top for first time in two years. Three shafts working, Nos. 4, 5, and 6, the first yielding best rock.

MINNESOTA

Mesabi Range

Tioga (Chisholm)—Fee owners and operator conducting joint drilling campaign to determine whether or not any ore lies below present main level.

MONTANA

Silver Bow County

Anaconda (Butte)—Rolling mill at Great Falls, Mont., in August converted 6,000,000 lb. refined copper into finished rods and wire. Plant running at capacity. Great Falls copper refinery at two-thirds capacity. Zinc plant still down.

North Butte (Butte)—August production of copper 1,450,122 lb.; July, 1,005,810; August, 1918, 1,931,837.

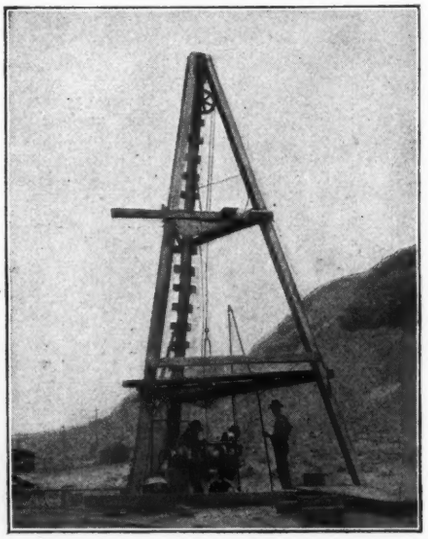
NEVADA

Lyon County

Douglass (Dayton)—Douglass tailings dump below Dayton again being reworked. Tailings from Comstock ores. Last effort to rework unsuccessful.

Nye County

Tonopah Belmont (Tonopah)—Dividend declared Sept. 15 a reduction of 10 per cent, owing to recent strike of miners at Tonopah.



DIAMOND DRILLING IN TONOPAH DISTRICT, NEVADA, BY TONOPAH EXTENSION MINING CO.

Pershing County

Jose-Davis M. & M. (Loring)—Has ordered 30-ton mill now on road. In Sheepherder workings ore developed on tunnel level for 100 ft. in length and 60 ft. deep; 200 tons broken, which management figures runs $200 per ton. W. I. Beauchamp manager and E. E. Roberts, former Congressman, president.

Loring Treasure Hill Mines (Loring)—East vein of Loring Treasure Hill can be traced for 1,500 ft., with high-grade streak on foot wall, many specimens showing visible gold.

Mayday Group (Loring)—On main vein a barren-looking black quartz assayed high in gold and is being developed to see if commercial body can be found. On southwest end of claim a silver-copper ore was found from which specimen assay went $102.50.

Nevada Honey Bee (Loring)—Under J. H. Bell, superintendent, twenty men are sinking Malley shaft and driving Benedetti tunnel. Former down 110 ft. First shipment from Honey Bee went $34.06 per ton. Company is financed by New York interests.

NEW MEXICO

Sierra County

Silver Monument (Chloride)—Taken over by Jack McCuthin and associates.

Lady Franklin (Lake Valley)—Running mill tests on silver ores preliminary to deciding process for new mill.

SOUTH DAKOTA

Custer County

Climax (Custer)—Shaft retimbered, and development of mica deposits begun. Shipments of mica will be made soon.

Lawrence County

Deadwood Lead & Zinc (Deadwood)—Concentrator in operation for only a short time. Scarcity of water given as reason for suspension.

Eagle Bird (Deadwood)—Incorporated with Fred Pennington, president, and Burt Rogers, secretary and treasurer. Securities being sold, and probable that work on ground on Squaw Creek will be started this year.

Custer Peak (Englewood) — Concentrator and mine closed down.

Pennington County

National Tin (Hill City)—Cowboy shaft enlarged to three compartments. Timbering of new compartment nearly completed. Drift being driven on 300 level. Machinery installation being made at mill, and plant should be ready for operation during October.

Egyptian (Keystone)—No work being done at property. Understood that company will be formed to finance further development.

TEXAS

Fort Bend County

Development at Blue Ridge Field giving encouraging results. Circle Oil Co.'s No. 1 Scott well 2,700 ft. deep, and good showing of oil made in bailing. West Production Co.'s No. 1 Luscher well also about 2,700 ft. deep, with oil showing. Both wells at considerable distance from original discovery, making possible extension of field.

Hardin County

Saratoga Field Completions: Regna Oil Co., No. 5 Ogden, set screen at 1,300 ft.; Peerless Oil Co., No. 6 Kirby, making small production by pumping; Sun Oil Co., testing No. 133 McShane well; Weldon Oil Co. also testing well.

Harris County

Macks Oil & Water Well Screen Co. has just let contract to W. C. Hendrick Construction Co. for two reinforced-concrete buildings. Entire plant when completed will consist of eight buildings. Main office 821 Kress Building, Houston.

Jackson County

At Edna, Texas Co. will drill on large ranch of L. Ward. Other drilling near Edna will be done by F. Seliner & Co., of Houston, on Kroop farm, near Vanderbilt; Coast Line Oil Corporation, on Calhoun farm, three miles southeast of Edna; and S. G. Drusher and associates, on Drusher land, northwest of town.

Jefferson County.

Texas Steel Co. (Beaumont)—At meeting of stockholders Sept. 3, four new directors elected: B. A. Steinhager, W. F. Graham, E. L. Boydkin, and R. S. Collins, all of Beaumont. Pig-iron plant at Rusk, Cherokee County, closed temporarily, owing to Railroad Administration raising freight rates. Suit filed for overcharges and $50,000 damages.

Lampasas County

Nineteen Locations made in county and derricks built. Wells being drilled are: Howell No. 1, on White Ranch; Key well, on Baxter ranch; Smith well, on Smith ranch; Groves No. 2 well at 600 ft.; St. Mary, on Le Compte ranch, at 700 ft., narrow oil-bearing strata being penetrated at 600 ft.; New York syndicate, drilling two wells on line between Lampasas and Coryell counties.

Liberty County

Recent Completions in Hull Field: Gulf Production Co., No. 1 Thomas installing pump; Big Four Oil Co., No. 5 Hannicker bailing at 2,500 ft.; Republican Production Co., No. 18 Dolbear abandoned; will drill another well. Field production about 8,000 bbl. daily.

Nueces County

Corpus Christi O. & G. (Corpus Christi)—White Point gas well, flowing wild for three years, successfully capped. Pipe line will be laid to supply Corpus Christi, and possibly Taft, with gas. Heavy concrete block laid around well to prevent it from breaking loose when valves closed.

UTAH

Salt Lake County

Garfield Smelting (Garfield)—Cloudburst on Sept. 18, falling directly on A. S. & R. smeltery, put plant out of operation for several days.

Utah County

Pacific Gold M. & M. (American Fork)—Property taken over by owners. Has been under lease.

WASHINGTON

Okanogan County

Arlington (Concunully)—Most consistent shipper of silver ores in district. Property well equipped and credited with good production. Two carloads good-grade silver ore in bins awaiting shipment. Property ten miles from Concunully.

Carl Frederick (Concunully)—Silver property nineteen miles southwest of Concunully; starting 120-ft. raise to explore high-grade ore showing in surface cut. C. Bernhard, manager.

Kankakee (Nespelem)—Lessees have struck native gold ore in ledge and have penetrated 11 ft.

Trinidad (Tonasket)—Silver property nine miles southwest of Tonasket has shaft down 35 ft. in mineralized zone carrying silver and lead. Starting a drift to get under favorable showings uncovered above.

Snohomish County

Boston American (Monte Cristo)—Preparing to start up after shutdown during war. Home office, Everett, Wash.

Good Hope (Monte Cristo)—Working small crew and trying to have state open road to Index to make shipping possible.

CANADA

British Columbia

F. J. Albo, of Rossland public schools, has won this year's scholarship for the Kootenays, offered annually by Consolidated Mining & Smelting Co. of Canada.

Carmi (Carmi)—W. H. Sawyer, superintendent, installing 75-ton concentrator.

North Star (Kimberley)—Has shipped first car since tramway and buildings were burned by forest fires this summer.

Beatrice (Lardeau District)—New Era Mines, Ltd., bondholders, plan to drain workings, ship dumps, and develop orebody further. Fourteen hundred feet of tunnel already driven, bunk houses built, and 1,500-ft. aërial tramway installed. Property ten miles from Beaton, B. C., and comprises three Crown-granted claims above timber line. Reached by four-mile motor road and six-mile pack trail.

Eureka (Nelson)—H. H. Vincent, president of Vincent Development Co., which is developing Eureka-Granite-Poorman property for Inland Mining Co., states survey of proposed 6,000-ft. extension to tramway is complete and contract for construction will be awarded immediately. Car of concentrates ready for shipment to Trail.

Cork Province (Slocan) — Recent shipment flotation concentrates returned 51.5 oz. in silver, 65.8 per cent lead, 5.2 per cent zinc. In same car were bull-jig concentrates that returned 29.2 oz. silver, 43.6 per cent lead, and 8.9 per cent zinc. Company will ship no more bull-jig concentrates. Publication of report of R. H. Stewart expected soon.

Lucky Jim (Slocan) — Spokane stockholders trying to work out plan to reorganize and secure 1½c. a share from each of 6,000,000 shares outstanding. This would give $90,000, of which about $70,000 would be used to pay all obligations.

Black Prince (Slocan) — First car shipped for year. Ore silver-lead.

Utica (Slocan)—Ore being taken out by Poyntz, McLellan, and MacDougall, lessees.

Belmont Surf Inlet (Surf Inlet)—August earnings $25,457, compared with $11,999 in July and $24,888 in August, 1918. Labor situation, which has been hampering operations, now improving.

Consolidated M. & S. (Trail)—Ore receipts from Aug. 21 to 31 inclusive were 11,551 gross tons. Largest custom shipment was 1,023 tons, from Mandy mine, The Pas, Manitoba. Company's Sullivan and Kimberley mines contributed 7,467 tons and Centre Star, of Rossland, B. C., 1,084 tons.

Nova Scotia

Nova Scotia S. & C. (Sydney)—Planning to erect new byproduct plant at Sydney mines, to cost over $2,000,000. Will necessitate enlarging present plant and erection of new blast furnace.

Ontario

Kerr Lake (Cobalt)—Will reduce capital from $3,000,000 to $2,400,000 by payment of part of capital to shareholders of record Sept. 22.

Waldman (Cobalt)—Leased to F. B. Mosure.

Miller Lake O'Brien (Gowganda)—Operations curtailed owing to low water for power purposes.

Kirkland Porphyry (Kirkland Lake)—Kirkland Porphyry having gone into voluntary liquidation, Orr property, held under option, will return to original owners. Option price $523,000.

Dome (Porcupine) — Output for August shows increase, tonnage treated being 25,000 tons, or 3,000 over July.

MEXICO

Sonora

Greene Cananea (La Cananea)—August production 4,200,000 lb. copper; 179,470 oz. silver; 880 oz. gold.

Market Report for Sept. 27 Will Appear In Issue Of Oct. 4

Industrial conditions in New York have made it expedient to close the forms of the *Journal* in advance of the routine schedule date. The usual market quotations are therefore necessarily omitted from this number. The market pages which would have appeared normally in the Sept. 27 issue will be published in the *Journal* of Oct. 4.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices, Metal Market Conditions, Average Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Sept.	Sterling Exchange	Silver		Sept.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
10	415½	112¾	61	15	417¼	113½	61⅛
11	415½	113	61¼	16	413¼	113½	61¾
12	415½	112	60¾	17	413	113½	61¾
13	417	112⅞	61				

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Daily Prices of Metals in New York

Sept.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot	N. Y.	St. L.	St. L.
10	.....	.....	.....	5.75@5.85	7.25@7.30
11	22 @22¼	54⅞	5.95@6.00	5.75@5.85	7.20@7.30
12	21¾@22¼	54⅞	5.95@6.00	5.75@5.85	7.10@7.20
13	21¾@22¼	55	5.95@6.00	5.75@5.85	7.10@7.20
15	21¾@22¼	55@55⅛	6.00@6.25	5.90@5.95	7.10@7.20
16	21¾@22¼	55@55¼	6.20@6.25	5.90@5.95	7.10@7.20
17	21¾@22¼	55¼	6.20@6.25	5.90@5.95	7.10@7.20

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Sept.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M.		Spot	3M.	Spot	3 M.	Spot	3 M.
10	100	100¾	109	281	274½	25¼	26	40¼	41¼
11	100	100¾	109	280	272¾	25¼	25¾	40¾	41¾
12	100	100½	109	282½	274½	25¼	25⅝	40⅝	41⅛
13	....	....	....	....	....	....	....	....	....
15	101	101¾	110	285½	280	25¼	25⅝	41½	42½
16	101	101½	110	287	279½	25⅝	25¾	41¾	42⅝
17	101	101¾	110	289	279¼	25⅝	26¼	42	42¾

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Metal Markets

New York, Sept. 17, 1919

Copper and zinc continued very dull, with some exhibition of weakness in zinc. On the other hand, lead turned very strong, and the market advanced, as was foreseen last week.

The stocks of metals in the hands of the British government on Sept. 1, with the comparative figures for August stated in parentheses, were as follows: Copper, 31,415 tons (41,697); lead, 94,138 tons (120,971); zinc, 34,724 tons (39,540); aluminum, 22,919,680 lb. (23,520,000 lb.); nickel 5,328,760 lb. (5,491,480 lb.); antimony, 7,584,640 lb. (9,880,640).

Reports from London continue to be to the effect that industrial affairs in Great Britain are becoming distinctly better. Port congestion, however, is a bar to some trades. It takes longer to get lead out of a government store than to bring it from Australia.

Transatlantic freight rates declined sharply this week, reflecting the increasing easiness in shipping conditions. Rates to British ports were quoted at $15; to Hamburg at $16; to Dutch ports and Antwerp at $12. Freight rates to French ports were booked at $15, with indications that even lower might be done. From San Francisco to Hongkong the rate advanced to $15, while to Kobe it declined to $12.

Copper

The dullness in copper continued. No business was done by the principal producers. Some business was done by agencies. The major part of the business, however, continued to be done by brokers reselling for consumers and speculators. The volume of this business was less than in the previous week, and the hope was again expressed that such accounts were about cleared up. However, Japanese houses, upon advices that copper had declined in Japan, became sellers on Sept. 12, and at about the same time British houses renewed offerings of ingot bars. They intimated a price of £113 to £113½, c.i.f. New York, which would be about 21c. delivered here.

In this market the differential between ingot bars and wire bars continued to prevail, and, indeed, became rather wider than previously, for the former were offered at 21⅞c. New York, while business was done in wire bars at 22¼c. Toward the close the market seemed to exhibit an easier tone, and there is no doubt that wire bars could be obtained from some quarters at 22¼c. delivered, which would be 22.10c. New York.

Copper Sheets.—The base price of copper sheets is 33½c. per lb. Market steady. Demand strong. Copper wire is quoted at 26@26½c. in carload lots, f.o.b. mill. Market dull.

Tin

A fair business was done at slightly higher prices, tin of 99 per cent grade closing at 55¼c. American producers are now making about 1,250 tons per month. Straits tin in this market was quoted at 56c. on Sept. 11-13, 56¼c. on Sept. 15-16, and at 56¼c.@56¾c. on Sept. 17.

Singapore quoted c.i.f. London £280 on Sept. 11, £281½ on the 12th, and £286 on the 15th.

The statistical position of tin is thought to be improving. London is bullish.

Lead

The labor troubles in Idaho and the threat of trouble at one of the important smelteries near St. Louis increased the tightness of a statistical position that was already strong. The largest producers have their books full of orders for a month ahead, and there are only a few producers who are able to offer any lead for prompt or early shipment. Shortage of railway cars makes shipment difficult even by them. In view of these circumstances, it was not surprising that an active demand for lead should develop. Following this, the A. S. & R. Co. advanced its price to 6¼c. on Sept. 15. Orders were taken at that price for October shipment. The aggregate of business during the week came to a fair total.

About the end of this month, or early next month, the St. Joseph Lead Co. will resume smelting at its plant at Herculaneum which has been idle since Feb. 14.

Zinc

The demand continued sluggish. Some producers became tired of waiting and made up their minds to sell. This resulted in a further decline in price. However, there were always bids somewhat under the market, which checked any tendency toward rapid movement downward. The market closed at 7.10c. to 7.20c., with nobody appearing desirous of buying and nobody seeming to be very anxious to sell.

The Eagle-Picher Lead Co. has bought the plant of the Robert Lanyon Zinc & Acid Co. at Hillsboro, Ill.

Zinc Sheets—The quoted price of zinc sheets is $10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 33c. per lb. No change. Market quiet.

Antimony—The market was quiet. We quote spot at 8½@8¾c. and futures at 9@9¼c.

Bismuth—We quote $2.96.

Cadmium—Unchanged at $1.40.

Nickel—Ingot, 42c.; shot, 43c.; electrolytic, 45c.

Quicksilver—Upon renewed buying the market advanced to $105. San Francisco telegraphs $100@$105 firm.

Silver and Platinum

Silver has advanced to 61¾d. on the information that the government of India has fixed the exchange value of the rupee at 2s., a rise of 2d. Market steady; China buying limited offerings.

Mexican dollars at New York: Sept. 11, 87; Sept. 12, 64¼; Sept. 13, 86¾; Sept. 15, 87½; Sept. 16, 87½; Sept. 17, 87½.

Platinum—The Government stock is reported all sold. Knowledge of this and the development of a strong demand caused the market to become very excited. We quote refined ingot at $130 to $140. It is possible that some sales were made at even higher prices.

Palladium—Unchanged at $120.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 13—Zinc blende, per ton, high, $49.70; basis 60 per cent zinc, premium, $46; Prime Western, $45; fines and slimes, $42.50@$40; calamine, basis 40 per cent zinc, $30. Average settling prices: Blende, $44.38; calamine, $30.70; all zinc ores, $43.55.

Lead, high, $70.35; basis 80 per cent lead, $70@$65; average settling price, all grades of lead, $66.36 per ton.

Shipments the week: Blende, 4,573; calamine, 291; lead, 1,037 tons. Value, all ores the week, $280,860.

The car situation has reached a point where further loading must await emptying some cars. Over 20,000 tons are now in transit, about 575 cars. Filled cars have moved away more rapidly, but, with heavy wheat shipments in transit, no empty cars are to be had. Some shipping is being done to nearby points in coal cars. Two smelteries are idle at Henryetta on account of labor trouble and lack of ore.

Platteville, Wis., Sept. 13—Blende, basis 60 per cent zinc, $45@$46 base for premium grade and $45 base for high lead or Prime Western grade. Lead ore, basis 80 per cent lead, $66 per ton. The zinc market was dull, and buyers of the high grades were not inclined to bid for ore at the week end. Shipments reported for the week are 1,934 tons blende, 125 tons galena, and 528 tons sulphur ore. For the year to date the totals are 70,041 tons blende, 4,489 tons galena, and 11,638 tons sulphur ore. During the week 2,909 tons blende was shipped to separating plants.

Other Ores and Minerals

Chrome Ore—Offered at $32 per ton, delivered in the East, without finding buyers.

Molybdenum Ore—Quoted nominally at 75c. per lb.

Tungsten Ore—The market is quite disorganized, owing to the uncertainty of tariff legislation. Chinese ore was offered at $7.40.

Pyrites — Spanish pyrites is quoted at 17½c. per unit for furnace-size ore, free from fines, c.i.f. New York or other Atlantic port. Sulphur companies reported to be selling at prices as low as $14@$15. Market unsettled.

New York—Sept. 17, 1919

Although it is probable that conservative influence in the labor world will prevail and that there will not be a general strike of iron and steel workers, the threatened suspension of work has been a disturbing factor in the market during the past week and still causes apprehension, says *The Iron Age.*

The net result of the agitation is that little buying has been done. The desire of consumers and distributors to secure material has been more pronounced than in the earlier talks of strike, but so has been the hesitancy of the producers to add to their commitments.

The demand for pig iron is not now active, and an Illinois foundry inquiry for about 10,000 tons for delivery in the first half of next year thus gains prominence. Persistent reports of weakness of basic continue, and there is a limited demand for all steel-making irons. Stove manufacturers in the Central West are having difficulty in maintaining full operation on account of scarcity of molders. The demand for stoves is greater there than the supply.

On ship material the Government has again obtained base quotations of 2.50c., Pittsburgh, for plates and 2.40c. for shapes. The former price is widely possible on attractive lots, but 2.45c. is the general market for structural material.

Buyers for oil-well developments have been pressing to get covered owing to the imminent stoppage of steel plants. Demand for oil pipe promises to last over at least two years.

Tin plate makers, with stocks in consumers' hands now well exhausted, look to having a banner year in 1920. Black sheets have sold in the Central West for $3 above regular prices.

Pittsburgh—Sept. 16

Wednesday night, Sept. 10, the special committee of six of the general committee constituted by twenty-four unions to organize the iron and steel industry announced that it was calling a strike for the industry to begin Monday, Sept. 22. The news created some surprise, both because it was thought the organization was not strong enough to produce a strike and because it was believed that in any case such a move would be deferred in deference to President Wilson's desires until the results of the White House conference on labor on Oct. 6 could be measured. The common view seemed to be that the chances of a strike of any magnitude following the strike call were relatively small.

When the report appeared yesterday morning that the strike call was to be rescinded there was scarcely a ripple in the trade. The original order was issued only after a prolonged debate among the labor organizers, and it is generally believed that Mr. Gompers personally is opposed to a strike being called at this time, particularly as the President has urged that there be a labor truce until after the White House conference on labor Oct. 6. It appears that Mr. Gompers has no direct authority in the matter, which is subject to the decision of the unions involved; but it is understood he has urged the union heads to recall the order and that at their meeting to be held in Pittsburgh tomorrow they will probably do so.

Though the claim repeatedly made by the labor agitators that the iron and steel producers wish to precipitate a strike is wholly unfounded, it is true that the manufacturers would prefer a strike and a settlement of the whole matter rather than an indefinite prolongation of the agitation. The manufacturers believe that the great majority of their employees are satisfied and do not want to strike, but it is clear that the agitation of the last few months has considerably lowered the efficiency of the men. It is reasonably certain that no large part of the men are actually organized, but there is a possibility that if a strike were once started it would grow. The policy of the manufacturers is well defined. They would simply close the works that would be affected and let them stay closed.

The steel market has been quiet, the mills being well filled with business for several months to come, based on the present rate of production, which is below capacity, chiefly because men are not working at normal efficiency. In oil-country goods there is a definite scarcity, due to the large amount of oil development planned, and inability to secure as much material as is desired in the Texas oil field will result in a condition that will involve the expiration of many leases without the prescribed drilling being done. In other lines there is no definite scarcity.

Fabricated steel-lettings in August represented 78½ per cent of fabricating

shop capacity, but large building projects involving the use of structural steel are not coming out at the pace of a few weeks ago, and there is no railroad demand except for a limited volume of material for car repairs. Nevertheless, the current make, representing 80 to 85 per cent of the entire productive capacity, is readily absorbed, and it does not appear that buyers are accumulating any stocks, although, on account of prospects of traffic difficulties later in the year, they would like to fortify themselves. Box cars are scarce, even at the present time, causing considerable tonnage of sheets to accumulate at mills. Tin plate is moving freely and wire products are moving fairly well.

Steel prices steady, and it is practically the universal feeling among producers that price advances should not be made. Of course, there is no possibility of any decline. Plates, which were set at 2.65c. by the March 21 schedule, have sold at 2.50c. more often than at the full price, and the 2.50c. price is now more often regarded as the real market price for desirable orders.

Pig Iron—Although it was the declared policy of furnacemen not to sell for next year, news is now coming out of a considerable volume of transactions, at current prices, through consumers giving their regular sources of supply the option of taking the business or seeing it placed elsewhere. An occasional sale of foundry iron for this year's delivery is made at $1 advance, but this is not general. Bessemer and basic are quiet in the open market, but requirements under contracts are heavy. We quote prices unchanged: Bessemer, $27.95; basic, $25.75; malleable, $26.25 @$27.25; foundry, $26.75; forge, $25.75, f.o.b. Valley furnaces, freight to Pittsburgh being $1.40.

Steel

Steel—Mills are having difficulty in meeting requirements under sheet bar contracts, but are generally succeeding, and there is hardly any open-market inquiry. Billets are quiet. We quote: Billets, $38.50; sheet bars and small billets, $42; slabs, $41; rods, $52.

Ferroalloys

Ferromanganese—Representatives of British ferromanganese producers are not quoting openly, as the complaint was made before the Federal Trade Commission charging them with "dumping." Their last quotation was $95, c.i.f. Domestic producers continue their asking price of $110, delivered, but it is understood this price could be shaded. Consumers are showing no interest in the market.

Coke

Coke—The furnace coke market presents an easier tone, but producers are still asking $4.75 for spot or prompt. Foundry coke shows better demand, with light offerings, and $6.25 to $6.50 is generally secured, depending on brand. The minimum has advanced $1 a ton within three or four weeks.

MONTHLY AVERAGE PRICES OF METALS

Silver

	New York			London		
	1917	1918	1919	1917	1918	1919
Jan.	75.630	88.702	101.125	36.682	44.356	48.438
Feb.	77.585	85.716	101.125	37.742	42.792	48.027
Mar.	73.861	88.082	101.125	36.410	43.620	48.171
April	73.875	95.346	101.125	36.963	47.215	48.886
May	74.745	99.505	107.135	37.940	48.980	52.104
June	76.971	99.500	110.430	39.065	48.875	53.806
July	79.010	99.625	106.394	40.110	48.813	54.133
Aug.	85.407	100.292	111.370	43.418	49.077	58.835
Sept.	100.740	101.125	.....	50.920	49.500	.....
Oct.	87.332	101.125	.....	44.324	49.500	.....
Nov.	85.891	101.125	.....	43.584	48.969	.....
Dec.	85.960	101.125	.....	43.052	48.492	.....
Year	81.417	96.772	.....	40.851	47.516	.....

New York quotations cents per ounce troy, 999 fine London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		(b) Electrolytic	
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	106.619
Feb.	23.500	16.763	110.000	78.700	125.000	95.700
Mar.	23.500	14.856	110.000	76.821	125.000	82.071
April	23.500	15.246	110.000	77.300	125.000	82.200
May	23.500	15.864	110.000	77.767	125.000	81.227
June	23.500	17.610	110.000	83.062	125.000	85.900
July	25.904	21.604	119.913	99.576	134.913	103.046
Aug.	26.000	22.319	122.000	97.300	137.000	106.429
Sept.	26.000	.....	122.000	.....	137.000	.....
Oct.	26.000	.....	122.000	.....	137.000	.....
Nov.	26.000	.....	122.000	.....	137.000	.....
Dec.	(a)	.....	118.447	.....	133.167	.....
Year	24.628	.....	115.530	.....	130.507	.....

(a) No market. (b) See note on page 490.

Tin

	New York		London	
	1918	1919	1918	1919
January	85.500	67.702	293.227	248.557
February	92.000	66.801	311.525	223.963
March	(a)	67.934	318.875	236.843
April	(a)	72.500	329.905	225.275
May	(a)	72.500	364.217	234.398
June	(a)	71.240	331.925	238.263
July	(a)	68.000	360.347	253.272
August	(a)	57.226	380.900	273.625
September	(a)	.....	343.905	.....
October	(a)	.....	335.543	.....
November	(a)	.....	323.550	.....
December	(a)	.....	267.736	.....
Av. year	(a)	.....	330.138	.....

(a) No average computed.

Lead

	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	6.782	5.432	6.684	5.316	29.00	37.227
February	6.973	5.057	6.899	4.784	29.00	28.675
March	7.201	5.226	7.091	4.992	29.00	27.952
April	6.772	4.982	6.701	4.722	29.00	24.888
May	6.818	5.018	6.704	4.773	29.00	23.852
June	7.611	5.340	7.511	5.070	29.00	22.544
July	8.033	5.626	7.750	5.408	29.00	23.457
August	8.050	5.798	7.750	5.583	29.00	24.750
September	8.050	.....	7.750	.....	29.00	.....
October	8.050	.....	7.750	.....	29.00	.....
November	8.050	.....	7.750	.....	31.20	.....
December	6.564	.....	6.324	.....	40.00	.....
Year	7.413	.....	7.222	.....	30.10	.....

Zinc

	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	7.836	7.272	7.661	6.922	54.000	56.045
February	7.814	6.623	7.639	6.273	54.000	46.150
March	7.461	6.500	7.286	6.150	54.000	38.500
April	6.890	6.465	6.715	6.114	54.000	36.118
May	7.314	6.429	7.114	6.079	54.000	35.477
June	8.021	6.901	7.791	6.551	54.000	36.763
July	8.688	7.873	8.338	7.523	54.000	41.815
August	8.985	7.789	8.635	7.439	54.000	39.338
September	9.442	.....	9.092	.....	54.000	.....
October	8.801	.....	8.451	.....	54.000	.....
November	8.491	.....	8.141	.....	54.100	.....
December	8.163	.....	7.813	.....	56.050	.....
Year	8.159	.....	7.890	.....	54.180	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pittsburgh

	Bessemer‡		Basic‡		No. 2 Foundry	
	1918	1919	1918	1919	1918	1919
January	$37.25	$33.60	$33.95	$31.40	$33.95	$32.40
February	37.25	33.60	33.95	31.40	33.95	32.40
March	37.25	32.54	33.95	31.40	33.95	29.12
April	36.15	29.35	33.95	27.15	33.95	28.15
May	36.20	29.35	33.00	27.15	34.00	28.15
June	36.36	29.35	33.16	27.15	34.16	28.15
July	36.60	29.35	33.40	27.15	34.40	28.15
August	36.60	29.35	33.40	27.15	34.40	28.15
September	36.60	.....	33.40	.....	34.40	.....
October	36.60	.....	34.40	.....	35.40	.....
November	36.60	.....	34.40	.....	35.40	.....
December	36.60	.....	34.40	.....	35.40	.....
Year	$36.67	.....	$33.70	.....	$34.45	.....

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. Exch.†	Sept. 16
Alaska Gold M.	2⅞
Alaska Juneau	‡2½
Am.Sm.&Ref.,Com.	78
Am.Sm. & Ref.,pf.	103¼
Am.Sm.Sec., pf., A.	85
Am. Zinc	23
Am. Zinc, pf.	58
Anaconda	69¼
Batopilas Min.	1¼
Bethlehem Steel	‡90
Butte & Superior	26¼
Butte Cop. & Zinc	11
Cerro de Pasco	55
Chile Cop	23⅞
Chino	43½
Colo. Fuel & Iron	46
Crucible Steel	186
Crucible Steel, pf.	99¼
Dome Mines	13½
Federal M. & S.	11
Federal M. & S., pf.	30¼
Great Nor., ore ctf.	44⅛
Greene Cananea	42⅛
Gulf States Steel	61½
Homestake	75
Inspiration Con.	60¼
International Nickel	26
Kennecott	35¼
Lackawanna Steel	86⅛
Mexican Petrol.	215¼
Miami Copper	27
Nat'l Lead, com.	80¼
National Lead, pf.	104
Nev. Consol.	18
Ontario Min.	6⅛
Ray Con	23⅛
Republic I.&S.,com.	93⅛
Republic I.&S., pf.	104½
St. Joseph Lead	14⅛
Sloss-Sheffield	67
Tennessee C. & C.	13½
U. S. Steel, com.	105⅛
U. S. Steel, pf.	114⅛
Utah Copper	85½
Va. Iron C. & C.	61
Worthington Pump.	84½

Boston Curb *	Sept. 16
Boston Ely	1⅛
Boston & Mont.	.81
Butte & Lon'n Dev.	.12
Calaveras	1⅛
Chief Con.	3⅛
Contact	.30
Cortez	.12
Crown Reserve	.25
Crystal Cop.	.11
Crystal Cop. (new)	.57
Eagle & Blue Bell	2⅛
First Nat. Cop.	1⅛
Gadsen Cop.	3⅛
Houghton Copper	.85
Intermountain	‡.05
Iron Blossom	‡.25
Iron Cap	11½
Majestic	.25
Mexican Metals	.05
Mojave Tungsten	.11
Nat. Zinc & Lead	.09
Nevada-Douglas	.09
New Baltic	2⅛
Oneco	.75
Rex Cons.	‡.20
United Verde Ex.	45
Yukon Gold	1⅛

San Fran.*	Sept. 16
Andes	.20
Best & Belcher	.08
Caledonia	‡.20
Challenge Con.	‡.15
Confidence	‡.25
Con. Virginia	2.00
Gould & Curry	.05
Hale & Norcross	.13
Jacket-Cr. Pt.	.15
Mexican	.19
Occidental	‡.40
Ophir	‡.42½
Overman	‡.08
Savage	.12
Sierra Nevada	.17
Union Con.	.33
Utah Con.	‡.03
Belmont	3.00
Jim Butler	.28
MacNamara	.65
Midway	.17
Mont.-Tonopah	‡.11
North Star	.06
Rescue Eula	.16
West End. Con.	1.45
Atlanta	.03
Booth	.07
Comb. Frac.	.04
Florence	.53
Jumbo Extension	.10
Kewanas	.04
Nevada Hills	.03
Nevada Packard	.30
Round Mountain	.30
Silver Pick	.09
Simon	1.80
White Caps	.16

Colo. Springs *	Sept. 16
Cresson Con.	2.31½
Doctor Jack Pot.	.02½
Elkton Con.	.03
El Paso	.16
Gold Sovereign	‡.02
Golden Cycle	1.50
Granite	.10
Isabella	.03½
Mary McKinney	‡.06½
Portland	.96
United Gold M.	.16½
Vindicator	.34

Boston Exch.†	Sept. 16
Adventure	‡1⅛
Ahmeek	78
Algomah	‡41½
Allouez	43½
Ariz. Com.	15
Arnold	.50
Bingham Mines	‡8½
Butte-Balaklava	.40
Calumet & Ariz.	74½
Calumet & Hecla	416
Carson Hill	25½
Centennial	‡18½
Copper Range	53½
Daly West	3½
Davis-Daly	11
East Butte	17½
Franklin	4½
Granby	‡67½
Hancock	‡7½
Hedley	‡12
Helvetia	5
Indiana	1½
Isle Royale	33½
Keweenaw	1
Lake	5½
La Salle	4½
Mason Valley	‡3½
Mass	7½
Mayflower	9
Michigan	8½
Mohawk	70
New Arcadian	4
New Cornelia	25
New Idria	‡11
Nipissing	11½
North Butte	15½
North Lake	‡1½
Ojibway	2
Old Dominion	42
Osceola	61
Quincy	71
St. Mary's M. L.	61½
Santa Fe	‡.35
Seneca	21
Shannon	2⅜
Shattuck-Ariz.	‡15½
So. Lake	2½
So. Utah	‡.30
Superior	7
Superior & Bost.	3½
Trinity	1½
Tuolumne	2
U. S. Smelting	69½
U. S. Smelting, pf.	49
Utah Apex	2½
Utah Con.	9½
Utah Metal	3½
Victoria	3½
Winona	2½
Wolverine	‡26½

N. Y. Curb.†	Sept. 16
Alaska B. C. Met.	¾
Alaska Mines	⅜
Big Ledge	⅜
Butte & N. Y.	‡.50
Caledonia	.42
Calumet & Jerome	.25
Can. Cop. Corpn.	1⅛
Cashboy	.07
Con. Ariz. Sm.	1½
Con. Coppermines	‡6½
El Salvador	4
Goldfield Con.	.17
Goldfield Merger	.04½
Hasbrouck Divide	.13
Hecla Min.	4⅛
Howe Sound	‡4½
Louisiana	⅜
Marsh	‡.12½
McKinley-Dar-Sa.	‡.65
Milford	‡.75
Mother Lode	.53
Mother Lode, (new)	5½
Nixon Nevada	.24
Ohio Cop.	‡.50
Rawley	‡2½
Ray Hercules	2⅜
Richmond	‡.50
Rochester Mines	‡.17
Silver King of Ariz.	¾
So. Am. G. & P.	9½
Standard S. L.	.25
Stewart	.22
Success	.05
Tonopah	⅜
Tonopah Divide	5½
Tonopah Ex.	2⅜
Tribullion	‡.25
Troy Arizona	‡.09
United Eastern	4⅜
Wilbert	.07½
Wilson Silver Mines	⅛

Toronto *	Sept. 16
Adanac	.12
Bailey	.04½
Beaver Con.	.40
Coniagas	2.70
Hargraves	.02½
Kerr Lake	4.00
La Rose	.25
Lake Shore	1.03
Min. Corp. of Can.	1.75
Peterson Lake	.11½
Teck-Hughes	.21
Temiskaming	.41
Trethewey	.35
Wettlaufer-Lor.	.03½
Davidson	.66
Dome Exten.	.32
Dome Lake	.16
Hollinger	6.75
McIntyre	2.04
Newray	.14
Porcu. Crown	.29
Vipond	‡.20
West Dome	.11

* Bid prices. † Closing prices. ‡ Last quotations.